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(71)(72) Applicants and Inventors: DEVINE, Carol, Y. [US/US]; 395 Palm Springs Drive, Colorado Springs, CO 80921 (US). DOLLAR, Tammy, E. [US/US]; 8175 Talon Court, Peyton, CO 80831 (US). MUNGUIA, Wayne, J. [US/US]; 5850 Northwind Drive, Colorado Springs, CO 80918 (US). SCHWARZ, Edward [US/US]; 462 Broome Street, New York, NY 10013 (US).

(74) Agents: GROLZ, Edward, W. et al.; Scully, Scott, Murphy & Presser, 400 Garden City Plaza, Garden City, NY 11530 (US).

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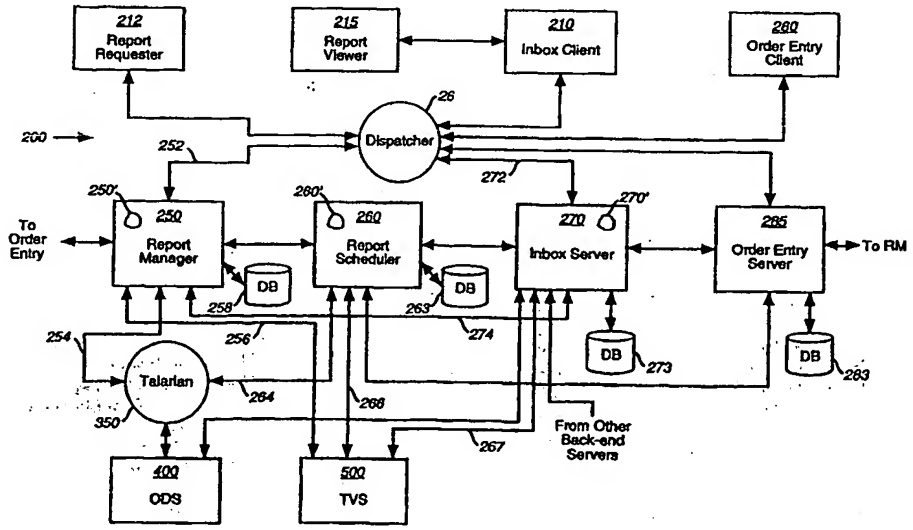

(57) Abstract

A Web/Internet based reporting system provides a common GUI enabling the requesting, customizing, scheduling and viewing of various types of reports generated by different server applications (400, 500) and/or application platforms. The reporting system includes a report manager (250), report scheduler (260), and report requester (212) applications capable of defining, creating, managing and tracking specific reports that are available to customers in accordance with customer entitlements. Metadata messaging empolyed to enable specific report option presentation, report customization and report execution/scheduling options. A Web–based system infrastructure is provided that enables the acquisition and secure presentation of customer reports to customers from any client browser application.

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INTEGRATED PROXY INTERFACE FOR WEB BASED REPORT REQUESTER TOOL SET

The present invention relates generally to information delivery systems and, particularly, to a novel, WWW/Internet-based, reporting service for customers requesting information located at remote back-end intranet servers of telecommunications service entities.

Major telecommunications service entities, e.g., MCI, AT&T, and Sprint, presently provide for the presentation and dissemination of customer account and network management information to their customers predominantly through a Windows-based graphical user interface resident on their computer workstation. Typically, service entity customers are enabled to directly dial-up, e.g., via a modem, or, alternately, via dedicated communication lines, e.g., ISDN, T-1, etc., to the entity's application and database servers, and initiate the generation of reports of their requested account information through the reporting GUI. The report requests initiated by the customer are processed by the entity's application server, which retrieves the requested customer information from one or more databases, processes and formats the information for downloading to the client's reporting GUI.

It is the case that the telecommunications service providers provide many different services, and many of the associated service applications have been developed independently over time, and, operate on many different operating platforms. For instance, MCI's Service View platform ("MSV") provides for the

generation of Toll-free Network Management data, priced call detail or "Perspective" data for usage analysis and trending, and unpriced call detail or real-time "TrafficView" data each of which requires a different reporting mechanism due to the nature of the data being presented. For example, much of the customers "Perspective" data is provided in a CD-ROM media and shipped to the customer, usually on a monthly basis, and requires extensive client-side processing to utilize the data. This cuts down on computing resources as the customer requires a dedicated application and GUI to process this type of data. Moreover, such reporting systems typically do not provide any report customization or presentation options for the customer, and any reporting customization is provided by an application specific program running on the client workstation. Furthermore, such systems do not readily provide for the scheduling of periodic or ad hoc "one-shot" reports.

It would be highly desirable to provide an Intranet/Internet/Web-based reporting system that provides a common GUI enabling both report requesting, customizing and viewing of various types of data from different server applications.

Furthermore, it would be desirable to provide an Intranet/Internet/Web-based reporting system including a report manager and requesting tool that manages the generation and presentation of specific reports that are available to customers, and enables specific report customization and scheduling options.

It would also be highly desirable to provide a Intranet/Internet/Web-based reporting system

infrastructure capable of providing for the secure initiation, acquisition and presentation of customer reports to customers from any computer workstation running a browser located anywhere in the world.

The present invention is directed to a novel Intranet/Internet/Web-based reporting system that provides a common GUI enabling the requesting, customizing, scheduling and viewing of various types of reports generated by different server applications and/or application platforms. More specifically, the present invention includes an Intranet/Internet/Web-based reporting system infrastructure employing report manager and report scheduler server components, and report requestor and viewer client components enabling customers to define various reports relating to their telecommunications network usage, in addition to managing the generation and presentation of specific reports. This infrastructure employs novel authentication and security features providing for the secure acquisition and compilation of customer reporting data, configuration and generation of reports, and presentation of reports on the customers workstation via a standard web browser. Further employed is an integrated proxy interface that reformats specific browser-based commands and communicates them to one or more corporate back-end fulfilling servers comprising a legacy system infrastructure to provide various data reports for customers.

Further features and advantages of the invention will become more readily apparent from a consideration of the following detailed description set forth with reference to the accompanying drawings,

which specify and show preferred embodiments of the invention, wherein like elements are designated by identical references throughout the drawings and in which:

Figure 1 illustrates the software architecture component comprising a three-tiered structure;

Figure 2 is a diagrammatic overview of the software architecture of the networkMCI Interact system;

Figure 3 is an illustrative example of a backplane architecture schematic;

Figure 4 illustrates an example client GUI presented to the client/customer as a browser web page;

Figure 5 is a diagram depicting the physical networkMCI Interact system architecture;

Figure 6 is a block diagram depicting the physical architecture of the StarWRS component of networkMCI Interact system;

Figures 7(a) - 7(d) illustrate flow diagrams depicting the report request/scheduling process 600 implemented by StarWRS Report Manager and Report Requestor tools of the invention;

Figure 8 illustrates an example Web/Internet-based home page screen providing general menu of customer options;

Figures 9(a)-9(h) illustrate various examples of report requestor screen dialogs enabling user customization of report requests.

Figure 10(a) illustrates an example browser based message center screen dialog;

Figure 10(b) illustrates an example report viewer dialog box used for requesting view of available generated reports;

Figures 11(a)-11(b) illustrate flow diagrams depicting the perpetually running, report request running/scheduling process 600;

Figure 12 illustrates a logical message format sent from the client browser to the desired middle tier server for a particular application;

Figures 13(a) and 13(b) are schematic illustrations showing the message format passed between the Dispatcher server and the application specific proxy (Figure 13(a)), and the message format passed between the application specific proxy back to the Dispatcher server (Figure 13(b)).

Figures 14(a)-14(c) illustrate a low level logic diagram depicting the multi-threaded proxy process.

The present invention is one component of an integrated suite of customer network management and report applications using a Web browser paradigm. Known as the networkMCI Interact system ("nMCI Interact") such an integrated suite of Web-based applications provides an invaluable tool for enabling customers to manage their telecommunication assets, quickly and securely, from anywhere in the world. The nMCI Interact system architecture is basically organized as a set of common components comprising the following:

1) an object-oriented software architecture detailing the client and server based aspect of nMCI Interact;

2) a network architecture defining the physical network needed to satisfy the security and data volume requirements of the networkMCI System;

3) a data architecture detailing the application, back-end or legacy data sources available for networkMCI Interact; and

4) an infrastructure covering security, order entry, fulfillment, billing, self-monitoring, metrics and support.

Each of these common component areas will be generally discussed hereinbelow.

Figure 1 is a diagrammatic illustration of the software architecture component in which the present invention functions. A first or client tier 10 of software services are resident on a customer work station 10 and provides customer access to the enterprise system, having one or more downloadable application objects directed to front end business logic, one or more backplane service objects for managing sessions, one or more presentation services objects for the presentation of customer options and customer requested data in a browser recognizable format and a customer supplied browser for presentation of customer options and data to the customer and for internet communications over the public Internet. Additionally applications are directed to front end services such as the presentation of data in the form of tables and charts, and data processing functions such as sorting and summarizing in a manner such that multiple programs are combined in a unified application suite. A second or middle tier 12, is provided having secure web servers and back end services to provide applications that establish user sessions, govern user

authentication and their entitlements, and communicate with adaptor programs to simplify the interchange of data across the network.

A third or back end tier 15 having applications directed to legacy back end services including database storage and retrieval systems and one or more database servers for accessing system resources from one or more legacy hosts.

Generally, the customer workstation includes client software capable of providing a platform-independent, browser-based, consistent user interface implementing objects programmed to provide a reusable and common GUI abstraction and problem-domain abstractions. More specifically, the client-tier software is created and distributed as a set of Java classes including the applet classes to provide an industrial strength, object-oriented environment over the Internet. Application-specific classes are designed to support the functionality and server interfaces for each application with the functionality delivered through the system being of two-types: 1) cross-product, for example, inbox and reporting functions, and 2) product specific, for example, toll free network management or Call Manager functions. The system is capable of delivering to customers the functionality appropriate to their product mix.

Figure 2 is a diagrammatic overview of the software architecture of the networkMCI Interact system including: the Customer Browser (a.k.a. the Client) 20; the Demilitarized Zone (DMZ) 17 comprising a Web Servers cluster 24; the MCI Intranet Dispatcher Server 26; and the MCI Intranet Application servers 30, and the data warehouses, legacy systems, etc. 40.

The Customer Browser 20, is browser enabled and includes client applications responsible for presentation and front-end services. Its functions include providing a user interface to various MCI services and supporting communications with MCI's Intranet web server cluster 24. As illustrated in Figure 3, the client tier software is responsible for presentation services to the customer and generally includes a web browser 14 and additional object-oriented programs residing in the client workstation platform 20. The client software is generally organized into a component architecture with each component generally comprising a specific application, providing an area of functionality. The applications generally are integrated using a "backplane" services layer 12 which provides a set of services to the application objects which provide the front end business logic and manages their launch. The networkMCI Interact common set of objects provide a set of services to each of the applications such as: 1) session management; 2) application launch; 3) inter-application communications; 4) window navigation among applications; 5) log management; and 6) version management.

The primary common object services include: graphical user interface (GUI); communications; printing; user identity, authentication, and entitlements; data import and export; logging and statistics; error handling; and messaging services.

Figure 3 is a diagrammatic example of a backplane architecture scheme illustrating the relationship among the common objects. In this example, the backplane services layer 12 is programmed

as a Java applet which can be loaded and launched by the web browser 14. With reference to Figure 3, a typical user session starts with a web browser 14 creating a backplane 12, after a successful logon. The backplane 12, inter alia, presents a user with an interface for networkMCI Interact application management. A typical user display provided by the backplane 12 may show a number of applications the user is entitled to run, each application represented by buttons depicted in Figure 3 as buttons 58a,b,c selectable by the user. As illustrated in Figure 3, upon selection of an application, the backplane 12 launches that specific application, for example, Service Inquiry 54a or Alarm Monitor 54b, by creating the application object. In processing its functions, each application in turn, may utilize common object services provided by the backplane 12. Figure 3 shows graphical user interface objects 56a,b created and used by a respective application 54a,b for its own presentation purposes.

Figure 4 illustrates an example client GUI presented to the client/customer as a browser web page 80 providing, for example, a suite 70 of network management reporting applications including: MCI Traffic Monitor 72; an alarm monitor 73; a Network Manager 74 and Intelligent Routing 75. Access to network functionality is also provided through Report Requester 76, which provides a variety of detailed reports for the client/customer and a Message Center 77 for providing enhancements and functionality to traditional e-mail communications.

As shown in Figures 3 and 4, the browser resident GUI of the present invention implements a

single object, COBackPlane which keeps track of all the client applications, and which has capabilities to start, stop, and provide references to any one of the client applications.

The backplane 12 and the client applications use a browser 14 such as the Microsoft Explorer versions 4.0.1 or higher for an access and distribution mechanism. Although the backplane is initiated with a browser 14, the client applications are generally isolated from the browser in that they typically present their user interfaces in a separate frame, rather than sitting inside a Web page.

The backplane architecture is implemented with several primary classes. These classes include COBackPlane, COApp, COAppImpl, COParm. and COAppFrame classes. COBackPlane 12 is an application backplane which launches the applications 54a, 54b, typically implemented as COApp. COBackPlane 12 is generally implemented as a Java applet and is launched by the Web browser 14. This backplane applet is responsible for launching and closing the COApps.

When the backplane is implemented as an applet, it overrides standard Applet methods init(), start(), stop() and run(). In the init() method, the backplane applet obtains a COUser user context object. The COUser object holds information such as user profile, applications and their entitlements. The user's configuration and application entitlements provided in the COUser context are used to construct the application toolbar and Inbox applications. When an application toolbar icon is clicked, a particular COApp is launched by launchApp() method. The launched application then may use the backplane for inter-

application communications, including retrieving Inbox data.

The COBackPlane 12 includes methods for providing a reference to a particular COApp, for interoperation. For example, the COBackPlane class provides a getApp() method which returns references to application objects by name. Once retrieved in this manner, the application object's public interface may be used directly.

As shown in Figure 2, the aforesaid objects will communicate the data by establishing a secure TCP messaging session with one of the DMZ networkMCI Interact Web servers 24 via an Internet secure communications path 22 established, preferably, with a secure sockets SSL version of HTTPS. The DMZ networkMCI Interact Web servers 24 function to decrypt the client message, preferably via the SSL implementation, and unwrap the session key and verify the users session. After establishing that the request has come from a valid user and mapping the request to its associated session, the DMZ Web servers 24 will re-encrypt the request using symmetric encryption and forward it over a second socket connection 23 to the dispatch server 26 inside the enterprise Intranet.

A networkMCI Interact session is designated by a logon, successful authentication, followed by use of server resources, and logoff. However, the world-wide web communications protocol uses HTTP, a stateless protocol, each HTTP request and reply is a separate TCP/IP connection, completely independent of all previous or future connections between the same server and client. The nMCI Interact system is implemented with a secure version of HTTP such as S-HTTP or HTTPS,

and preferably utilizes the SSL implementation of HTTPS. The preferred embodiment uses SSL which provides a cipher spec message which provides server authentication during a session. The preferred embodiment further associates a given HTTPS request with a logical session which is initiated and tracked by a "cookie jar server" 28 to generate a "cookie" which is a unique server-generated key that is sent to the client along with each reply to a HTTPS request. The client holds the cookie and returns it to the server as part of each subsequent HTTPS request. As desired, either the Web servers 24, the cookie jar server 28 or the Dispatch Server 26, may maintain the "cookie jar" to map these keys to the associated session. A separate cookie jar server 28, as illustrated in Figure 2 has been found desirable to minimize the load on the dispatch server 26. This form of session management also functions as an authentication of each HTTPS request, adding an additional level of security to the overall process.

As illustrated in Figure 2, after one of the DMZ Web servers 24 decrypts and verifies the user session, it forwards the message through a firewall 25b over a TCP/IP connection 23 to the dispatch server 26 on a new TCP socket while the original socket 22 from the browser is blocking, waiting for a response. The dispatch server 26 will unwrap an outer protocol layer of the message from the DMZ services cluster 24, and will reencrypt the message with symmetric encryption and forward the message to an appropriate application proxy via a third TCP/IP socket 27. While waiting for the proxy response all three of the sockets 22, 23, 27 will be blocking on a receive. Specifically, once the

message is decrypted, the wrappers are examined to reveal the user and the target middle-tier (Intranet application) service for the request. A first-level validation is performed, making sure that the user is entitled to communicate with the desired service. The user's entitlements in this regard are fetched by the dispatch server 26 from StarOE server 49 at logon time and cached.

If the requestor is authorized to communicate with the target service, the message is forwarded to the desired service's proxy. Each application proxy is an application specific daemon which resides on a specific Intranet server, shown in Figure 2 as a suite of mid-range servers 30. Each Intranet application server of suite 30 is generally responsible for providing a specific back-end service requested by the client, and, is additionally capable of requesting services from other Intranet application servers by communicating to the specific proxy associated with that other application server. Thus, an application server not only can offer its browser a client to server interface through the proxy, but also may offer all its services from its proxy to other application servers. In effect, the application servers requesting service are acting as clients to the application servers providing the service. Such mechanism increases the security of the overall system as well as reducing the number of interfaces.

The network architecture of Figure 2 may also include a variety of application specific proxies having associated Intranet application servers including: a StarOE proxy for the StarOE application server 39 for handling authentication order

entry/billing; an Inbox proxy for the Inbox application server 31, which functions as a container for completed reports, call detail data and marketing news messages, a Report Manager Proxy capable of communicating with a system-specific Report Manager server 32 for generating, managing and receiving notification of customized reports including, for example: call usage analysis information provided from the StarODS server 33; network traffic analysis/monitor information provided from the Traffic view server 34; virtual data network alarms and performance reports provided by Broadband server 35; trouble tickets for switching, transmission and traffic faults provided by Service Inquiry server 36; and toll free routing information provided by Toll Free Network Manager server 37.

As partially shown in Figure 2, it is understood that each Intranet server of suite 30 communicates with one or several consolidated network databases which include each customer's network management information and data. In the present invention the Services Inquiry server 36 includes communication with MCI's Customer Service Management legacy platform 40(a). Such network management and customer network data is additionally accessible by authorized MCI management personnel. As shown in Figure 2, other legacy platforms 40(b), 40(c) and 40(d) may also communicate individually with the Intranet servers for servicing specific transactions initiated at the client browser. The illustrated legacy platforms 40(a)-(d) are illustrative only and it is understood other legacy platforms may be interpreted into the network architecture illustrated in Figure 2 through an intermediate midrange server 30.

Each of the individual proxies may be maintained on the dispatch server 26, the related application server, or a separate proxy server situated between the dispatch server 26 and the midrange server 30. The relevant proxy waits for requests from an application client running on the customer's workstation 10 and then services the request, either by handling them internally or forwarding them to its associated Intranet application server 30. The proxies additionally receive appropriate responses back from an Intranet application server 30. Any data returned from the Intranet application server 30 is translated back to client format, and returned over the internet to the client workstation 10 via the Dispatch Server 26 and at one of the web servers in the DMZ Services cluster 24 and a secure sockets connection. When the resultant response header and trailing application specific data are sent back to the client browser from the proxy, the messages will cascade all the way back to the browser 14 in real time, limited only by the transmission latency speed of the network.

The networkMCI Interact middle tier software includes a communications component offering three (3) types of data transport mechanisms: 1) Synchronous; 2) Asynchronous; and 3) Bulk transfer. Synchronous transaction is used for situations in which data will be returned by the application server 40 quickly. Thus, a single TCP connection will be made and kept open until the full response has been retrieved.

Asynchronous transaction is supported generally for situations in which there may be a long delay in application server 40 response. Specifically, a proxy will accept a request from a customer or client

10 via an SSL connection and then respond to the client 10 with a unique identifier and close the socket connection. The client 10 may then poll repeatedly on a periodic basis until the response is ready. Each poll will occur on a new socket connection to the proxy, and the proxy will either respond with the resultant data or, respond that the request is still in progress. This will reduce the number of resource consuming TCP connections open at any time and permit a user to close their browser or disconnect a modem and return later to check for results.

Bulk transfer is generally intended for large data transfers and are unlimited in size. Bulk transfer permits cancellation during a transfer and allows the programmer to code resumption of a transfer at a later point in time.

Figure 5 is a diagram depicting the physical networkMCI Interact system architecture 10. As shown in Figure 5, the system is divided into three major architectural divisions including: 1) the customer workstation 20 which include those mechanisms enabling customer connection to the Secure web servers 24; 2) a secure network area 17, known as the DeMilitarized Zone "DMZ" set aside on MCI premises double firewalled between the both the public Internet 25 and the MCI Intranet to prevent potentially hostile customer attacks; and, 3) the MCI Intranet Midrange Servers 30 and Legacy Mainframe Systems 40 which comprise the back end business logic applications.

As illustrated in Figure 5, the present invention includes a double or complex firewall system that creates a "demilitarized zone" (DMZ) between two

firewalls 25a, 25b. In the preferred embodiment, one of the firewalls 29 includes port specific filtering routers, which may only connect with a designated port on a dispatch server within the DMZ. The dispatch server connects with an authentication server, and through a proxy firewall to the application servers. This ensures that even if a remote user ID and password are hijacked, the only access granted is to one of the web servers 24 or to intermediate data and privileges authorized for that user. Further, the hijacker may not directly connect to any enterprise server in the enterprise intranet, thus ensuring internal company system security and integrity. Even with a stolen password, the hijacker may not connect to other ports, root directories or applications within the enterprise system.

The DMZ acts as a double firewall for the enterprise intranet because the web servers located in the DMZ never store or compute actual customer sensitive data. The web servers only put the data into a form suitable for display by the customer's web browser. Since the DMZ web servers do not store customer data, there is a much smaller chance of any customer information being jeopardized in case of a security breach.

As previously described, the customer access mechanism is a client workstation 20 employing a Web browser 14 for providing the access to the networkMCI Interact system via the public Internet 15. When a subscriber connects to the networkMCI Interact Web site by entering the appropriate URL, a secure TCP/IP communications link 22 is established to one of several

Web servers 24 located inside a first firewall 29a in the DMZ 17. Preferably at least two web servers are provided for redundancy and failover capability. In the preferred embodiment of the invention, the system employs SSL encryption so that communications in both directions between the subscriber and the networkMCI Interact system are secure.

In the preferred embodiment, all DMZ Secure Web servers 24 are preferably DEC 4100 systems having Unix or NT-based operating systems for running services such as HTTPS, FTP, and Telnet over TCP/IP. The web servers may be interconnected by a fast Ethernet LAN running at 100 Mbit/sec or greater, preferably with the deployment of switches within the Ethernet LANs for improved bandwidth utilization. One such switching unit included as part of the network architecture is a HydraWEB™ unit 45, manufactured by HydraWEB Technologies, Inc., which provides the DMZ with a virtual IP address so that subscriber HTTPS requests received over the Internet will always be received. The Hydraweb™ unit 45 implements a load balancing algorithm enabling intelligent packet routing and providing optimal reliability and performance by guaranteeing accessibility to the "most available" server. It particularly monitors all aspects of web server health from CPU usage, to memory utilization, to available swap space so that Internet/Intranet networks can increase their hit rate and reduce Web server management costs. In this manner, resource utilization is maximized and bandwidth (throughput) is improved. It should be understood that a redundant Hydraweb™ unit

may be implemented in a Hot/Standby configuration with heartbeat messaging between the two units (not shown). Moreover, the networkMCI Interact system architecture affords web server scaling, both in vertical and horizontal directions. Additionally, the architecture is such that new secure web servers 24 may be easily added as customer requirements and usage increases. The use of the HydraWEB™ enables better load distribution when needed to match performance requirements.

As shown in Figure 5, the most available Web server 24 receives subscriber HTTPS requests, for example, from the HydraWEB™ 45 over a connection 44a and generates the appropriate encrypted messages for routing the request to the appropriate MCI Intranet midrange web server over connection 44b, router 55 and connection 23. Via the Hydraweb™ unit 45, a TCP/IP connection 38 links the Secure Web server 24 with the MCI Intranet Dispatcher server 26.

Further as shown in the DMZ 17 is a second RTM server 52 having its own connection to the public Internet via a TCP/IP connection 48. This RTM server provides real-time session management for subscribers of the networkMCI Interact Real Time Monitoring system. An additional TCP/IP connection 48 links the RTM Web server 52 with the MCI Intranet Dispatcher server 26.

With more particularity, as further shown in Figure 5, the networkMCI Interact physical architecture includes three routers: a first router 49 for routing encrypted messages from the Public Internet 15 to the HydraWeb™ 45 over a socket connection 44; a second

router 55 for routing encrypted subscriber messages from a Secure Web server 24 to the Dispatcher server 26 located inside the second firewall 25b; and, a third router 65 for routing encrypted subscriber messages from the RTM Web server 52 to the Dispatcher server 26 inside the second firewall. Although not shown, each of the routers 55, 65 may additionally route signals through a series of other routers before eventually being routed to the nMCI Interact Dispatcher server 26. In operation, each of the Secure servers 24 function to decrypt the client message, preferably via the SSL implementation, and unwrap the session key and verify the users session from the COUser object authenticated at Logon.

After establishing that the request has come from a valid user and mapping the request to its associated session, the Secure Web servers 24 will re-encrypt the request using symmetric RSA encryption and forward it over a second secure socket connection 23 to the dispatch server 26 inside the enterprise Intranet.

The data architecture component of networkMCI Interact reporting system is focused on the presentation of real time (un-priced) call detail data, such as provided by MCI's TrafficView Server 34, and priced call detail data and reports, such as provided by MCI's StarODS Server 33 in a variety of user selected formats.

All reporting is provided through a Report viewer GUI application interface which support spreadsheet, a varity of graph and chart type, or both simultaneously. For example, the spreadsheet

presentation allows for sorting by any arbitrary set of columns. The report viewer may also be launched from the inbox when a report is selected.

Report management related data is also generated which includes 1) report profiles defining the types of reports that are available, fields for the reports, default sort options and customizations allowed; and 2) report requests defining customer specific report requests including report type, report name, scheduling criteria, and subtotal fields. This type of data will be resident in a Report Manager server database and managed by the Report Manager server.

The Infrastructure component of the nMCI Reporting system includes means for providing secure communications regardless of the data content being communicated. The nMCI Interact system security infrastructure includes: 1) authentication, including the use of passwords and digital certificates; 2) public key encryption, such as employed by a secure sockets layer (SSL) encryption protocol; 3) firewalls, such as described above with reference to the network architecture component; and 4) non-repudiation techniques to guarantee that a message originating from a source is the actual identified sender. One technique employed to combat repudiation includes use of an audit trail with electronically signed one-way message digests included with each transaction.

Another component of the nMCI Interact infrastructure includes order entry, which is supported by the Order Entry ("StarOE") server. The general categories of features to be ordered include: 1) Priced Reporting; 2) Real-time reporting; 3) Priced Call

Detail; 4) Real Time Call Detail; 5) Broadband SNMP Alarming; 6) Broadband Reports; 7) Inbound RTM; 8) Outbound RTM; 9) Toll Free Network Manager; and 10) Call Manager. The order entry functionality is extended to additionally support 11) Event Monitor; 12) Service Inquiry; 13) Outbound Network Manager; 14) Portfolio; and, 15) Client View.

The Self-monitoring infrastructure component for nMCI Interact is the employment of mid-range servers that support SNMP alerts at the hardware level. In addition, all software processes must generate alerts based on process health, connectivity, and availability of resources (e.g., disk usage, CPU utilization, database availability).

The Metrics infrastructure component for nMCI Interact is the employment of means to monitor throughput and volumes at the Web servers, dispatcher server, application proxies and mid-range servers. Metrics monitoring helps in the determination of hardware and network growth.

To provide the areas of functionality described above, the client tier 10 is organized into a component architecture, with each component providing one of the areas of functionality. The client-tier software is organized into a "component" architecture supporting such applications as inbox fetch and inbox management, report viewer and report requestor, TFNM, Event Monitor, Broadband, Real-Time Monitor, and system administration applications. Further functionality integrated into the software architecture includes applications such as Outbound Network Manager, Call Manager, Service Inquiry and Client View.

The present invention focuses on the client and middle-tier service and application proxy components that enable customers to request, specify, customize, schedule and receive their data and account information in the form of reports that are generated by the various back-end application servers. Referred to herein as "StarWRS", this WWW/Internet Reporting System 200, as shown in Figure 6, comprises the following components and messaging interfaces:

1) those components associated with the Client GUI front end including a report requestor client application 212, a report viewer client application 215 and, an Inbox client application 210 which implement the logical processes associated with a "Java Client", i.e., employs Java applets launched from the backplane (Figure 3) that enable the display and creation of reports and graphs based on the fields of the displayed reports, and, allows selection of different reporting criteria and options for a given report; and,

2) those middle-tier server components enabling the above-mentioned reporting functionality including: a Report Manager server 250, a Report scheduler server 260, and an Inbox Server 270. Also shown in Figure 6 are the system Order Entry client application 280 and a corresponding Order Entry Server 285 supporting the StarWRS reporting functionality as will be described.

Each of these components will now be described with greater particularity hereinbelow.

The Report Manager ("RM") server 250 is an application responsible for the synchronization of report inventory with the back-end "Fulfilling" servers

400, 500; retrieval of entitlements, i.e., a user's security profiles, and report pick list information, i.e., data for user report customization options, from the system Order Entry server 280; the transmission of report responses or messages to the Dispatcher server 26 (Figure 6); the maintenance of the reporting databases; and, the management of metadata used for displaying reports. In the preferred embodiment, the RM server 250 employs a Unix daemon that passively listens for connect requests from the GUI client applications and other back-end servers and deploys the TCP/IP protocol to receive and route requests and their responses. Particularly, Unix stream sockets using the TCP/IP protocol suite are deployed to listen for client connections on a well-known port number on the designated host machine. Client processes, e.g., report requestor 212, desiring to submit requests connect to RM 250 via the dispatcher 26 by providing the port number and host name associated with RM 250. For particular back-end server 400 providing priced reporting data, a Talarian smart socket connection 254 is provided. Request messages received by the RM server are translated into a "metadata" format and validated by a parser object built into a report manager proxy 250' that services requests that arrive from the GUI front-end. If the errors are found in the metadata input, the RM 250 will return an error message to the requesting client. If the metadata passes the validation tests, the request type will be determined and data will be retrieved in accordance with the meta data request after which a standard response will be sent back to the requesting client. As shown in Figure 6, interface sockets 252 are shown connecting the

Dispatcher server 26 and the RM server 250 and, other socket connections 254, 256 are shown interfacing with respective back end servers 400 and 500. In one embodiment, server 400 provides a customer's priced billing data through a Talarian smart socket messaging interface 254 to the Report Manager. Particularly, a back-end billing mainframe application known as the StarODS server provides such priced call detail data. Additionally, as shown in Figure 6, call detail data is FTP'd directly to the Inbox Server and a message is sent to the report manager server 250 from the Traffic View server ("TVS") 500. Although not shown in Figure 6 it should be understood that the RM 250 server can manage reporting data for customer presentation from other back-end and legacy servers including, e.g., Broadband, Toll Free Network Management, and Event Monitor servers, etc. in order to present to a customer these types of network management and reporting data.

The report manager server additionally utilizes a database 258, such as provided by Informix, to provide accounting of metadata and user report inventory. Preferably, an SQL interface is utilized to access stored procedures used in processing requests and tracking customer reports. A variety of C++ tools and other tools such as Rogue Wave's tools.h++ are additionally implemented to perform metadata message parsing validation and translation functions.

The Report Manager server 250 additionally includes the scheduling information, however, a report scheduler server component passes report requests to the back-end fulfilling servers 400, 500 at the scheduled times.

Particularly, the Report Scheduler ("RS") server component 260 is, in the preferred embodiment, a perpetually running Unix daemon that deploys the TCP/IP protocol to send report requests to the back-end fulfilling servers such as the StarODS server 400, TVS server 500, and receive their responses. More particularly, the RS server 260 is a Unix server program that is designed to handle and process report requests to the fulfilling servers by deploying Unix stream sockets using the TCP/IP protocol suite, sending the request for customized reports to client connections on a well-known port number on the designated host machine. As shown in Figure 6, interface socket connections 264, 266 are shown interfacing with respective back end servers 400 and 500. In the case of priced billing data from StarODS 400, report requests are published by the RS server 260 to a pre-defined subject on the Talarian Server. When handling other incoming messages published by back end servers using Talarian SmartSockets 4.0, another daemon process is necessary that uses Talarian C++ objects to connect their message queue and extract all messages for a given subject for storage in a database table contained in database 263. Each message includes the track number of the report that was requested from the fulfilling server.

From the report requestor interface, the user may specify the type of reporting, including an indication of the scheduling for the report, e.g., hourly, daily, weekly or monthly. For priced data the user has the option of daily, weekly, or monthly. For real-time, or unpriced data, the user has the option of hourly, daily, weekly or monthly. The report scheduler

interface additionally enables a user to specify a pager or E-mail account so that an e-mail or pager message may be sent to indicate when a requested report is in the Inbox server 270.

As shown in Figure 6, the report scheduler server 260 interfaces directly with the Report Manager server 250 to coordinate report request scheduling and processing. It should be understood that the respective report management and scheduling functions could be performed in a single server.

The Inbox Server component 270 serves as the repository where the completed user report data is stored, maintained, and eventually deleted and is the source of data that is uploaded to the client user via the dispatcher over a secure socket connection 272 between the Web server and the browser. It is also a Unix program that is designed to handle and process user requests submitted in meta data format using an Informix database. Once report results are received from the StarODS 400 and TVS 500 and any other back-end or fulfilling servers (not shown), the Report Manager server 250 communicates the corresponding report metadata to the Inbox server 270 over socket connection 274 as shown in Figure 6. The metadata will be stored in the Inbox server database 273 along with the report results. Thus, if the meta data is required to be changed, it will not interfere with the information needed to display the reports contained in the Inbox. Additionally, as shown in Figure 6, the Inbox server interfaces with the report scheduler to coordinate execution and presentation of reports.

The StarOE server 280 is the repository of user pick lists and user reporting entitlements as

shown in database 283. Particularly, it is shown interfacing with the Inbox server 270 and report scheduler servers 260. The Report Manager does not interface with or contain metadata for StarOE. It will, however, include information in the report metadata that will tell the Report Requestor it needs to get information (i.e., Pick Lists) from StarOE server 285.

A common database may be maintained to hold the common configuration data which can be used by the GUI applications and by the mid-range servers. Such common data will include but not be limited to: customer security profiles, billing hierarchies for each customer, general reference data (states, NPA's, Country codes), and customer specific pick lists: e.g., ANI's, calling cards, etc.. An MCI Internet StarOE server will manage the data base for the common configuration of data.

With regard to the front-end client GUI components, the above-mentioned Inbox client application 210 functions as an interface between the client software and the Inbox server 270 for presenting to the customer the various type of reports and messages received at the Inbox including all completed reports, call detail, and marketing news messages. Preferably, the messages for the user in the inbox are sorted by type (report, call detail, alarms) and then by report type, report name, date, and time.

Particularly, the Inbox client application uses the services of the backplane (Figure 3) to launch other applications as needed to process report messages. The inbox will also use the services of the data export objects to provide a save/load feature for

inbox messages, and, is used to provide a user-interface for software upgrade/download control. Inbox messages are generated by the versioning services of the backplane; actual downloads will be accomplished by a request through the inbox.

In the preferred embodiment, the inbox client is able to receive information on multiple threads to allow a high priority message to get through even if a large download is in progress. Typically, the browser is configured to allow more than one network connection simultaneously, i.e., the polling thread on the client uses a separate connection to check for new messages, and starts a new thread on a new connection when a new message is detected. In this way, multiple messages may be downloaded simultaneously.

The Report Requestor application 212 is a GUI Applet enabling user interaction for managing reports and particularly includes processes supporting: the creation, deletion, and editing of the user's reports; the retrieval and display of reports based on selected criteria; the display of selected option data; and the determination of entitlements which is the logical process defining what functionality a user can perform on StarWRS. In the preferred embodiment, the Report requestor additionally enables a user to specify the frequency of report generation, e.g., periodically, or as "one-shots" to be performed at a later time. As described herein, the report scheduler service maintains a list of requested reports for a given user, and forwards actual report requests to the appropriate middle-tier servers at the appropriate time. Additional functionality is provided to enable

customers to manage their inventory, e.g., reschedule, change, or cancel (delete) report requests.

In the preferred embodiment, the report requestor utilizes the platform client JAVA code to communicate with the report manager server. To communicate with the StarOE for user security, hierarchy, paging and e-mail, etc. the Report Requestor uses StarOE client Java code.

Report Requestor JAVA applets implementing the above-described report requestor functionality, are downloaded to the the customer's workstation in the form of a cab file after initial login.

The Report Viewer application 215 is a GUI Applet enabling a user to analyze and display the data and reports supplied from the fulfilling servers such as StarODS 400, Traffic View ("TVS") 500, and other systems such as Broadband and toll free network manager. Particularly, the Report Manager 250 includes and provides access to the metadata which is used to tell the Report Requestor what a standard report should look like and the "pick-list" options the user has in order for them to customize the standard report. It is additionally used to tell the Report Viewer client how to display the report, what calculations or translations need to be performed at the time of display, and what further customization options the user has while viewing the report. It additionally includes a common report view by executing a GUI applet that is used for the display and graphing of report data and particularly, is provided with spreadsheet management functionality that defines what operations can be performed on the spreadsheet including the moving of columns, column suppression, column and row

single and multiple selection, import and export of spreadsheet data, printing of spreadsheet, etc. It is also provided with report data management functionality by defining what operations can be performed on the data displayed in a spreadsheet including such dynamic operations as sorting of report data, sub-totaling of report data, etc.. Furthermore, the report viewer 215 is provided with functionality enabling the interpretation of Meta Data; and, functionality enabling communication with the Backplane (Figure 3). The Report Viewer application 215 additionally accepts messages telling it to display an image or text that may be passed by one of the applications in lieu of report data (e.g., Invoice, Broadband report, etc.)

All reporting is provided through the Report Viewer interface which supports text displays, a spreadsheet, a variety of graphic and chart types, or both spreadsheet/graph simultaneously. The spreadsheet presentation allows for sorting by any arbitrary set of columns. The report viewer 215 is launched from the inbox client 210 when a report is selected.

By associating each set of report data which is downloaded via the Inbox server 270 with a "metadata" report description object, reports can be presented without report-specific presentation code. At one level, these metadata descriptions function like the catalog in a relational database, describing each row of a result set returned from the middle tier as an ordered collection of columns. Each column has a data type, a name, and a desired display format, etc. Column descriptive information will be stored in an object, and the entire result set will be described by a list of these objects, one for each column, to allow

for a standard viewer to present the result set, with labeled columns. Nesting these descriptions within one another allows for breaks and subtotaling at an arbitrary number of levels.

The same metadata descriptions may be used to provide common data export and report printing services. When extended to describe aggregation levels of data within reporting dimensions, it can even be used for generic rollup/drilldown spreadsheets with "just-in-time" data access.

The metadata data type may include geographic or telecommunications-specific information, e.g., states or NPAs. The report viewer may detect these data types and provide a geographic view as one of the graph/chart types.

An overview of the report request/scheduling process 600 implemented by StarWRS Report Manager and Report Requestor tools will now be described herein in view of Figures 7(a) - 7(d) as follows:

In preliminary steps, a user first establishes communication with the DMZ Web server at step 602 and logs on to the nMCI Interact system by entering the user's name and password onto a logon dialog box, as indicated at step 604. Then, at steps 606-608, an application running on the backplane directs a "Validate User Message" to the StarOE server 280 via the web server and dispatcher servers (Figure 6) to direct the StarOE server 280 to perform security validation and authenticate the user ID and password. It is understood that all communication to the StarOE server is via TCP/IP with a Unix process listening on a known TCP port. The StarOE server acts as a proxy when messages are sent from the Dispatcher

server 26 and supports synchronous transactions. All data and security information is accessed by direct queries to a StarOE server database 283, such as provided by Informix. Once a user is logged on, the Web Server (Figure 2(b)) requests a current list of authorized applications from the StarOE server 285 as indicated at steps 608 and 610. Particularly, a "Get User Application Request" message is communicated to the StarOE server via the backplane which queries the Informix database to obtain a list of authorized applications, i.e., services, for the user and which determines which buttons on the home page are active, thus controlling their access to products. This information is downloaded by a GUI applet that is executed via the Backplane (not shown) and incorporated into the home page that is presented to the user as indicated at steps 612 -614. An exemplary home page screen display 290 is shown in Figure 8 which provides a list of icons representing the possible options available to the user.

Referring back to Figure 7(a), the steps 615 and 616 indicate the selection and presentation of the Report Requestor display which presents the reporting options to a user in accordance with that user's entitlements as determined at previous step 610. Specifically, upon selection of a Report Requestor icon 292 from the home page screen display 290 of Figure 8, a StarWRS report requestor web page is presented to the customer.

Appendix H provides the format and content of the nMCI Interact common objects downloaded to the Report Requestor client application to enable web-based reporting. As shown in Appendix H, the Report

Requestor first asks for common objects for a user's default timezone, language and currency. The Report Requestor objects are invoked to retrieve from StarOE the various customer entitlements relating to security, geographical hierarchy, billing hierarchy, and paging and e-mail notification, as further shown in Appendix H.

Figure 9(a) illustrates an exemplar dialog box 295 provided on the report requestor web page that is presented to the user after the logon and authentication process. From this dialog, the user is enabled to edit an existing report maintained in the report manager inventory, by selecting "edit" button 350, generate a new report by selecting "new" button 353, copy an existing report by selecting button 354, or delete an existing report by selecting button 355. When creating a new report or editing an existing report, the user may enter the desired reporting options including: 1) the report product, as indicated by menu 358, and which includes toll-free, MCI Vision, and MCI Vnet options; 2) the report category, as indicated by menu 359, and which includes options for: analyzing traffic, call center, call detail, checking calling frequencies, financial, marketing, monitoring usage, and telecommunications categories for toll-free, Vnet and Vision customers; 3) the report type, as indicated by menu 360, and which includes priced call detail data or traffic data options; and 4) a report direction, as indicated by selection areas 363, and which includes inbound, outbound, or both directions. Referring to the flow chart of Figure 7(b), user selection of the report product, report category, report type, and report direction, is indicated at step

620. Additionally, at step 625, the user may select the report format associated with a reporting category. For example, in the screen display of Figure 9(a), associated with the analyze traffic report category, the report format options indicated in selection field 365 include the following: area code summary, country code summary, state summary, range summary, city summary, frequent numbers, payphone report, usage summary, calling card summary, IDAC/Supp Code Summary, Day of Week Distributions, Hourly Distribution, Call Access Summary and review calls options. For the financial report category, report formats include: longest calls, most expensive calls, Off Peak Calls, payphone report, usage summary, calling card summary, and area code summary; for marketing report category, report formats include: country code summary, state summary, frequent numbers, frequent area code summary, frequent state, and frequent cities. For the telecommunications report category, report formats include: call duration summary, IDAC/Supp Code Summary and Call Access Summary; for the call center report category, report formats include: most active toll free numbers, Hourly Distribution, Day of Week Distributions, state summary, and country code summary. For the monitor usage report category, report formats include: longest calls, most expensive calls, most active calling card and most active toll free numbers. For the check calling frequencies report category, report formats include: frequent numbers, frequent area code, frequent country codes, frequent state and frequent cities. It should be understood that enablement of any of these reporting options is based according to predefined user entitlements. That

is, "Get User Security" message with a reporting application set, and a "Get User Report Security" message are sent to the StarOE server 285 via the Dispatcher server to retrieve that user's detailed security profile (entitlements) for a user that has the reporting application option. These entitlements include a list of all the report products, i.e., Vnet, Vision, Toll free, report types (priced or unpriced) and the report categories that are available for that user.

In accordance with the user report selections, if a report had already been created and maintained in the report manager database, it will be displayed in the report inventory field 368 of Figure 9(a). Referring back to Figure 7(b), at step 626, a determination is made as to whether an existing report from inventory is selected. If an existing report is not selected then the user is prompted to generate a new report according to customization options that the user is entitled for the selected report product, category, type, etc., as indicated at step 630. If an existing report is selected at step 626 based on the report product, category, type, etc., then the user is prompted at step 628 to select from among the following options: a report edit option, as shown at step 635; a report delete option, in which case the selected report will be deleted at steps 638 and 639; and, a report copy option, in which case an existing report will be copied, e.g., for subsequent editing, as shown at steps 640 and 641.

Whether creating a new report or editing an existing report, the user is enabled to select customization options as indicated at step 630, Figure

7(b). Figure 9(b) illustrates the dialog screen 296 presented to the user showing all the report customization categories for building a new report and editing an existing report. From this screen and related report building dialog boxes, all of the initial values for retrieving the MetaData, customization options and GUI builder options from the report manager server 250 necessary to build (edit) a report are provided in accordance with the user's entitlements. Thus, in view of the examplar web page shown in Figure 9(b), a user may provide the following customization and report builder options as indicated in the field 370: general customization options, by selecting field 371; layout customization options, by selecting field 373; access customization options, by selecting field 375; hierarchy customization options, by selecting field 377; geographic customization options, by selecting field 378; and, notification customization options, by selecting field 379. For the following description regarding Figure 9(b) it is assumed that the area code summary format had been selected, however, it should be understood that the same principles apply to any selected format.

With regard to the "general" customization options, the user is enabled to specify or change the report title, by selecting field 371a, report description, by selecting field 371b, and the report schedule, by selecting field 371c. For the example selection of report title customization shown in Figure 9(b), the right hand field 380 will present the user with a field 381 for entering the title of the report. If an existing inventory report had been selected, then the field 380 will be display the existing title.

Generally, for each of the customization screens displayed for existing reports, Report Manager will autopopulate the right hand field 380 with the existing report values.

When selecting the report schedule 371c, the user is presented with a screen 297, as shown in Figure 9(c). The entry options for selection in the right hand field 380 includes: selection of time zone, by menu choice 382; selection of the report schedule radio buttons 383 to specify the report as recurring, daily, weekly, monthly, or hourly entry field the nature of screen; a time range for the report as specified by entry fields 384; and, a date range for the report as specified by entry fields 385. The user may also specify the report as a "one-shot" by selecting radio button 386.

Referring back to exemplar screen shown in Figure 9(b), with regard to the layout customization options, the user is enabled to specify or change the number of report rows, by selecting field 373a, and specify or change the report columns, by selecting field 373b. For example, selection of report columns customization will present the user with a columns customization screen such as example screen display 298 presented as shown in Figure 9(d). In Figure 9(d), the right hand field 380 indicates a column tab 387, and a sorts tab, 388. The column tab enables the user to specify add or remove columns, with the selection of individual columns names provided in field 389. An example description of the column headers for an example selection of columns is shown in field 390.

Referring back to Figure 9(d), selection of report sorts customization tab 388 will present the

user with a sorts customization screen such as example screen display 299 presented as shown in Figure 9(e). The sorts tab enables the user to specify columns to be sorted in an available sorts selection field 391, whether totals are to be made, whether the column data to be provided is in ascending or descending order, for example, as provided by selection of buttons 392, shown in Figure 9(e). In the preferred embodiment, the Report Manager provides the customer with the ability to specify select columns as primary and secondary sorts. The user may specify additional secondary sorts in addition to the default sorts. For example, the user may provide the following sorts: for a Longest Call Report, a primary sort is Number of Minutes in descending order. For a Most Expensive Call Report, the primary sort is dollars in descending order. For a most Active 800# Report, a primary default sort is the Number of Calls but may be changed to Number of Minutes, or dollars, all in descending order; a Secondary sort is Toll Free Number in ascending order. For a Most Active Calling Card Report, a primary default is Number of Calls but may be changed to Number of Minutes, or dollars, all in descending order; a Secondary sort is Card Number in ascending order. For an Area Code Summary Report, the primary default sort is Area Code in descending order but may be changed to Number of Calls, Number of Minutes or dollars. For a Call Duration Summary report, the primary sort is Duration Range in ascending order. For a Country Code Summary report, the primary default sort is Country code in ascending order but may be changed to one of the following: Number of Calls, Number of Minutes, or dollars (in descending order). For the State Summary

report, a primary default sort is State code in ascending order but may be changed to one of the following: Number of Calls, Number of Minutes, or dollars (in descending order). For the Frequent Numbers Report, a primary default sort is Number of Calls but may be changed to Number of Minutes, or dollars, all in descending order; a secondary sort is Number Called in ascending order. For the Frequent Area Code Report, a primary default sort is Number of Calls but may be changed to one of the following: Number of Minutes, or dollars, all in descending order, or Area Code in ascending order; a secondary sort is Area Code in ascending order. For a Frequent State Report, a primary default sort is Number of Calls but may be changed to Number of Minutes, or Dollars, all in descending order, or State Code in ascending order; a secondary sort is State in ascending order. For Frequent Cities Report, a primary default sort is Number of Calls but may be changed to Number of Minutes, or dollars, all in descending order, or City Code in ascending order; a secondary sort is City in ascending order. For a Payphone Report, sort is by 800 Number. For a Review Calls Report, a primary default is date, but may be changed to Time or Billing Hierarchy. For a Call Detail File report, a primary default is Date, but may be changed to time or billing hierarchy.

Referring back to exemplar screen shown in Figure 9(b), with regard to the access customization options, the user is enabled to specify or change an accounting "IDAC" code or supplemental code, by selecting field 375a, and specify or change the inbound access type, by selecting field 375b. For example,

selection of inbound access customization presents the user with a web page having an inbound access customization screen such as example screen display 301 presented as shown in Figure 9(f). In Figure 9(f), depending upon the selected report format, the right hand entry field 304 presents the user with the following selectable access types: dial 1, card, dedicated, 800 Remote Access, Direct Dial fax, store/forward fax, 800 Business line (highlighted in the Figure 9(f)), 800 wide area telecommunications service, 800 dedicated, 800 Network Call Redirect, local, cellular.

Referring back to exemplar screen shown in Figure 9(b), with regard to the hierarchy customization options, the user is enabled to specify or change the billing location by selecting field 377a. Upon selection of the billing location customization option, the user is presented with a web page having a customization screen such as example screen display 303 presented as shown in Figure 9(g). In Figure 9(g), depending upon the selected report format, the right hand screen presents the user with three tabs: a corporations tab 307, a search tab, 308, and, a selected items tab 309. When selected, the corporations tab 307 enables the user to add or remove a corporate ID to/from a billing location hierarchy in the entry field 310. A search of corporate IDs may be performed by selecting the search tab 308, and items that have been selected may be displayed in a field (not shown) presented by selection of the selected items tab. Likewise, referring back to exemplar web page screen shown in Figure 9(b), with regard to the geographic customization options, the user is enabled

to specify or change the billing location by selecting field 377a. Upon selection of the billing location customization option, the user is presented with a web page having a customization screen such as example screen display 311 presented as shown in Figure 9(h).

In Figure 9(h), depending upon the selected report format, the right hand screen presents the user with three tabs: a countries tab 312, a search tab, 313, and, a selected items tab 314. When selected, the countries tab 307 enables the user to select, add or remove a country that may be a subject for reporting as provided in the entry field 320. A search of countries may be performed by selecting the search tab 313, and items that have been selected may be displayed in a field (not shown) presented by selection of the selected items tab 314.

Referring back to exemplar screen shown in Figure 9(b), with regard to the notification customization options, the user is enabled to specify report notification by paging, by selecting field 379a, and, report notification by e-mail, by selecting field 379b. Upon selection of the paging notification option, the user is presented with a web page having a customization screen (not shown) presenting the user to select or enter that user's page number, PIN number and a paging message description. Upon selection of the e-mail notification option, the user is presented with a web page having a customization screen (not shown) presenting the user to select or enter that user's e-mail address.

As mentioned above with respect to Figure 6, the Report Requestor client application 212 gains access to the Metadata stored at the Report Manager

server 250 through messaging. Particularly, as hereinafter described, a message generated by the Report Requestor in accordance with the user request is first received by the report manager proxy 250'. In the preferred embodiment, the report manager proxy comprises a set of tools in the form of reusable objects, preferably written in C++ code, or the like. For example, a parser object tool is employed to decompose the Metadata messages sent by the report requestor 212 to validate the message. If errors are found in the Metadata input, the RM will return an error message to the requesting client. If the Metadata passes the validation tests, the request type is then determined and the appropriate service will be invoked after which a standard response is sent back to the requesting client.

The Report Manager 250 implements stored procedures to translate the message, perform the request, and send the information back to the Report Requestor 212 which uses the metadata to determine what a standard report should look like, the customization options the user has, and the types of screens that should be used for the various options (i.e., single selection, multiple selections, etc.).
It is understood that the selection of available standard template reports is based on the user's entitlements.

The following list provides the types of requests that may be initiated by the Report Requestor 212 and the responses performed by the Report Manager 250: 1) Get/Send report template list (GRTL/SRTL) - which request retrieves the list of all standard report templates for all products and is used only to obtain

general report information, e.g., report title, description, etc.; 2) Get/Send report template detail (GRTD/SRTD) - which request retrieves the details of a specific standard report template; 3) Get/Send user report list (GURL/SURL) - which request retrieves the list of all user reports for the report format selected from a user report table and is used only as a request for general report information, e.g., report title, status, etc.; 4) Get/Send user report detail (GURD/SURD) - which request retrieves the details of a specific user's report; 5) Add report definition/Acknowledgment (ARD/ARDA) - which requests addition of a user-created report to a user report table. If the report is a scheduled report, this request is also communicated to the fulfilling server at the time the report is due; 6) Delete report definition/Acknowledgment (DRD/DRDA) - which request deletes a user-created report from the user table; 7) Copy report definition/Acknowledgment (CRD/CRDA) - which request creates a duplication of the report the user is editing (other than the report title) and creates a new report ID for it; 8) Update Reporting Schedule/Acknowledgment (URS/URSA) - which request updates the scheduling information on a report without having to send a Delete and Add request; and, 9) Get Pick List/Acknowledgment (GPL/GPLA) - which request enables the Report Requestor 212 to get a pick list provided by StarOE server.

In a preferred embodiment, as shown in Table 1, the interface message sent to the RM server 250 from the report requestor via the Dispatcher server 24 comprises a three to four character message acronym followed by request specific parameters.

Parameter Name	Parameter Type	Required	Acceptable Value
Request	3 or 4 Characters	Yes	Msg acronym
Data parms...	Characters	No	

Table 1

Table 2 illustrates the interface message format returned by the RM server 250.

Parameter Name	Parameter Type	Required	Acceptable Value
Response	Char (4)	Yes	Msg acronym
Error Code	Char (4)	Yes	0 = OK or error
Data parms...	Char #	No	

Table 2

As shown in Table 2, the response message to be returned in Metadata format preferably includes a four character message acronym followed by an error code. A successful request (or a request acknowledgment) generates a response with an error code of "0". Additional data specific to the response follows this error code. If any server receives a message which is not known, the response message will echo the message acronym back along with an appropriate error code.

Appendix A provides a series of tables containing the content for each metadata message request that can be sent by the report requestor 212 for each of the enumerated user requests, in addition

to the content of the corresponding metadata message responses by the RM server 250. As an example, when a user requests a list of all standard report templates that can be created for a specified product, category, and product type, e.g., toll free unpriced data, an example metadata format is as follows:

GRTL<PRODUCT=V,DATATYPE=C,DATACAT=U,IO=O>

where GRTL is the message name, the PRODUCT indicates the product type, e.g., V=Vnet, C=CVNS, S=Vision, T= toll free, F= Traffic view, etc. DATATYPE indicates the data type, e.g. R=reports, D=call detail, etc., and DATACAT represents the report category, e.g., P=priced, U=unpriced.

In the hereinafter described manner, the GRTL message is received by the StarWRS proxy server application 250' to enable the RM server 250 to perform the query into the RM Informix database having the data associated with the request. Specifically, after selecting the Report Requester from the browser or the Toolbar, a WRSApp object is launched. At its creation, the WRSApp object creates a DataManager object to guide the data and which initiates a CommunicationManager object to manage all communication between the client and the server. The CommunicationManager utilizes a RptManagerMsg object to create: 1) a GRTL; 2) a WRSCommWrapper for direct communication with the backend; and, 3) a WRSReportManagerUtilParser to format the data returned. In response, the Report Manager creates a Dispatcher object, which contains the

business logic for handling metadata messages at the back-end and utilizes the services of a RMParser class. Upon determining that the client has sent a valid message, the appropriate member function is invoked to service the request. Upon receiving the message, the Report Manager creates the Parser object (RMParser) which takes the message apart and invokes a validation object which validates the message.

In response to the GRTL message, the data returned by the Report Manager server 250 for this particular request may include the following data in metadata format as follows:

```
SRTL<ERROR=0, REPORTS = <RptCategoryDescription1
=<RptTitle1.1, RptTemplateID1.1, RptCategoryType1.1>,
<RptTitle1.2, RptTemplateID1.2, RptCategoryType1.2>>,
<RptCategoryDescription2 =<RptTitle2.1, RptTemplateID2.1,
RptCategoryType2.1>, <RptTitle2.2, RptTemplateID2.2,
RptCategoryType2.2>>, …
<RptCategoryDescription#n=<RptTitle#n.n,
RptTemplateID#n.n, RptCategoryType#n.n>, <RptTitle#n.n,
RptTemplateID#n.n, RptCategoryType#n.n>>>
```

wherein RptID# indicates a standard report template ID, RptTitle# indicates the standard report template title, RptCategory# indicates the report category, e.g. Monitor Usage, Analysis Traffic, Historical, Executive Summary, Call Detail, etc.; and, RptDescript indicates the standard report template description displayed to the user. Thus, for each Report Template Category, there will be the list of reports with each entry containing a Report Template Title, a Report Template

Description and the Report Template ID.

The SRTL message is sent from the StarWRS RM proxy server to the report requestor for presentation to the customer. Specifically, the SRTL response is built inside the esql wrapper function after obtaining the necessary information through the stored procedure from the Report Manager Informix database. The Report Manager creates the RMServerSocket object and sends the SRTL message back to the client.

To retrieve details of the standard report template, the GRTD request message request is sent having content shown in the table in Appendix A. When specified, the Report ID field indicates an existing report that a user may wish to edit.

The SRTD response generated by the RM server is formatted in metadata as follows:

< Report Template ID=ID#,

NODE1=<node level1, label value1, assigned unique screen identification1, >,

NODE2=<node level2, label value2, assigned unique screen identification2, <control ID2.1, field value2.1, data location2.1>, <control ID2.2, field value2.2, data location2.2>, <..,..,..>>,

NODE#n=<node level#n, label value#n, assigned unique screen identification#n, <control ID#n.1, field value#n.1, data location#n.1>, <control ID#n.2, field value#n.2, data location#n.2>>

In the SRTD message, the MetaTreeData Label fields include such values as General, Report Name, Report Description, Scheduled Execution, etc. The MetaCtrlInfo MetaField Value fields may be blank or may contain the selection options available to the user. This information is taken from the report template database.

As another example, when a report request is submitted to retrieve a full list of user created reports from a user report table, i.e., a template list for a particular report product, category, and type, the example metadata format is as follows:

```
GURL<USERID=jeanvnet2,RPTTMPID=1,ENTPID=00022924,PRODUCT=T
,DATACAT=U>
```

with UserID and ReportTemplateID fields specified. Specifically, this process entails invoking the Communication Manager object to communicate with the RM server in order to obtain a SURL metadata message. The CommunicationManager utilizes the RptManagerMsg object to create: 1) a GURL, 2) a WRSCommWrapper for direct communication with the backend, and, 3) a WRSReportManagerUtilParser to format the data returned. The parser returns a hash table containing the User Report List. At the RM server, the Report Manager creates an Dispatcher object that contains the business logic for handling metadata messages at the back-end and utilizes the services of the RMParser class. Upon determining that the client has sent a valid message, the appropriate member function is invoked to service

the request. The Report Manager, upon receiving a message, creates a Parser object (RMParser) which takes the message apart and invokes a validation object which validates the message.

In response to the GURL request, the data returned is taken from a user report table in the RM server database. The generic SURL message in Metadata format returned by the RM server 250 includes the following information:

```
REPORTS = <UserRptCategory1    = <UserRptTitle1,
UserRptID1, activeflag, report type, statusdate
>>, <UserRptCategory2    = <UserRptTitle2,
UserRptID2, activeflag, report type,
statusdate>>,… <UserRptCategory#n    =
<UserRptTitle#n, UserRptID#n, activeflag, report
type, statusdate>>>
```

wherein for each user report categroy, there is a list of reports where each entry contains a UserRptID# indicating a user-defined report template ID, a UserRptTitle# indicating the user's report template title, and a UserRptCategory# indicating the user report category. Specifically, the SURL response is built inside an esql wrapper function after obtaining the necessary information through a stored procedure from the Informix database. The Report Manager creates the RMServerSocket object and sends the SURL message back to the client.

To retrieve the details of a specific user's report, the GURD message is sent having data as

contained in the table shown in Appendix A. Specifically, when the user selects a report from the Inventory List on the Report Requestor, a Communication Manager object is invoked to communicate with the RM server in order to obtain a SURD metadata message. The CommunicationManager object first utilizes the RptManagerMsg object to create: 1) a GURD metadata message, 2) a WRSCommWrapper for direct communication with the backend, and 3) the RSReportManagerUtilParser to format the data returned. The parser organizes the data into a series of nodes which are utilized to create the report builder tree on the report requestor customization screen. Later this data will be extracted from the node and used to construct the screen related to the node. The Report Manager server creates the MCIDispatcher object which contains the business logic for handling metadata messages at the back-end and utilizes the services of the RMParser class. Upon determining that the client has sent a valid message, the appropriate member function is invoked to service the request. The Report Manager, upon receiving a message, creates the Parser object (RMParser) which takes the message apart, invokes a validation object which validates the message and builds a response inside the esql wrapper function after obtaining the necessary information through the stored procedure from the Informix database. The Report Manager creates the RMServerSocket object and sends the SURD/SRTD message back to the client. The responsive SURD metadata message corresponding to a retrieve user report detail (GURD) request has the following metadata syntax:

< Report Template ID=ID#,

NODE1=<node level1, label value1, assigned unique screen identification1, >,

NODE2=<node level2, label value2, assigned unique screen identification2, <control ID2.1, field value2.1, data location2.1>, <control ID2.2, field value2.2, data location2.2>, <..,..,..>>,

NODE#n=<node level#n, label value#n, assigned unique screen identification#n, <control ID#n.1, field value#n.1, data location#n.1>, <control ID#n.2, field value#n.2, data location#n.2>, <..,..,..>>,

This response thus may include the report information having detailed items including: UserReportID (UserID), User's report name (UserName), product (UserProd), Threshold (UserThreshold), User Report Description (UserDescript), Report Columns (UserFields), Report column headings (UserHeaders), and, in addition, customization options with fields indicating, *inter alia*, columns to display (UserHeaders), user-defined criteria (UserCriteria), a sort order (UserOrder) and scheduling selections (UserSched), the last update of this report (UserLastUpdate) and, the Report status (if adhoc) (UserStatus), etc.

If a request is made to add a user-created report to a User_report table maintained by the RM Server 250, the ARD metadata message having fields defined in the table provided in Appendix A is processed by the RM server 250. An example message in metadata format to initiate the addition of a user-created report for TVS Inbound data is as follows:

ARD<USERID=jeanvnet2,ENTPID=00022924,STDRPTID=75,NAME=

Payphone Summary TVS Inbound,PRODUCT=T,CATEGORY=Standard Report,THRESHOLD=<>,SCHEDULE=A<START=199808010000,END=199808111200>,RANGETYPE=1,SCHEDTYPE=A,TIMEZONE=45,NDIALED=<8886520001~8886520002>,DESCRIPTION=Summarizes Payphone Calls by Toll Free Number,ACTIVE=1, MMADDR=jean.jerzak@mci.com,MMTEXT= Message is in,PGT=a,PGPIN=0000000,PGTXT=654654654, EMAIL=1,PAGE=1, LANG=1234, CURR=2345> MMADDR=userfirst.userlast@mci.com, MMTEXT=this is a message, PGT=1234, PGPin=1234, PGTxt=this is another message,EMAIL=1,PAGE=1, TIMEZONE=25>

An example message in metadata format to initiate the addition of a user-created report for StarODS Inbound/Outbound combined priced call detail data is as follows:

ARD<USERID=jeanvnet2,ENTPID=00022924,STDRPTID=91,NAME= City Summary All Tokens,PRODUCT=S,CATEGORY=Analyze Traffic,THRESHOLD=<RECCOUNT=20>,SCHEDULE= A<START=199806020000,END=199808152300>,RANGETYPE=1,SCHEDTYPE=A,TIMEZONE=45,BILLING=INBOUND<<90000003,90000003><NA,NA><NA,NA>>INBOUND<<90000004,90000004><NA,NA><NA,NA>>,CARDNO=<1235468795255~45646*>,IDAC=<12345678~16*~888*~878979879879987>,GEO=GEO<<001,001 USA/WORLD ZONE1><NA,NA><NA,NA><NA,NA><NA,NA>>,IACCESS=<7~9~10~8>,OACCESS=<4~2~12~3~1>,IDISTRANGE=<0~2~1>,ODISTRANGE=<A~B~C>,IUSAGE=<3~1~5~2>,OUSAGE=<3~1~2>,SORTBY=<47D>,DESCRIPTION=This report summarizes call detail by the originating city and state (USA) / province (CA) for inbound and the terminating city and state (USA) / Province (CA) for outbound calls. ,COLUMNS=<47~49~72~84~

89~62~85~59~61~87~88~37~63~64~66~65>,ACTIVE=1,TOTALMODE=0,
MMADDR=jean.jerzak@mci.com,MMTEXT=here is a
message,PGT=a,PGPIN=0000000,PGTXT=5465465465,EMAIL=1,PAGE=
1,LANG=1234, CURR=2345>

In this example, the "NAME" field refers to the Report Name (e.g., city summary); the "PRODUCT" field refers to the report product (Vision); the "THRESHOLD" field refers to the record count; the "DESCRIPTION" field refers to the report description; the "COLUMNS" refers to the number of columns specified for a report by the user; the "BILLING" field refers to the specified report billing entitlement, i.e., billing hierarchy, the "IDAC" refers to the specified accounting code; the "GEO" field pertains to the geographic area which is being reported, i.e., geographical hierarchy; the "IACCESS" field refers to the inbound access type and the "OACCESS" refers to the outbound access; the "SORTBY" field indicates the report column sorting customization with "A" indicating column(s) having data to be sorted in ascending order and, "D" indicating column(s) having data to be sorted in descending order; the "SCHEDULE" field referring to the scheduling type, e.g., with "A" indicating an ad-hoc report, and the user specified date range on which to report as indicated by the "START" and "END" fields, and additionally, the scheduling frequency information in the case of a recurring report; the SUBTOTALCOLUMNS field, referring to the report columns having data to be subtotaled; and, the "EMAIL" and "PAGE " fields indicating reporting notification via e-mail or paging, respectively.

Furthermore, for each of the metadata messages in Appendix A, including the Delete Report Definition (DRD), copy report definition (CRD), and update report scheduling (URS) messages, the report manager server 250 responds to the Report Requestor with the processing results. In the case of a copy report, a new User Report ID is assigned and returned by RM. When editing an existing report, e.g., a TVS (traffic) or StarODS (priced call data) report, the user may make changes to the Report Title, the Report Description, the Report scheduling, the 800 numbers and thresholds. For StarODS priced call data reports, customers may provide additional customization options including: number of rows, report columns, access codes, access types, billing location, geographic location, paging notification, and e-mail notification. More specifically, when the user selects a report from the inventory list (Figure 9(a)) or a new report, an WRSEdit Screen is launched to provide the editing capabilities which are available for the report format. WRSedit guides the screens through the process of retrieving the screens' data. Some of the screens need data which has not yet been retrieved, such as 800 numbers or geographic locations. These screens manage the requests to the DataManager object to create the get pick list (GPL) message (Appendix A), which launches the CommunicationManager object to perform this task. The CommunicationManager utilizes the RptManagerMsg object to create the GPL, the WRSCommWrapper for direct communication with the backend, and the WRSReportManagerUtilParser to format the data returned. In response, the Report Manager

server creates the MCIDispatcher object and invokes the MCIRMParser class. Upon determining that the client has sent a valid message, the appropriate member function is invoked to service the request. The Report Manager, upon receiving a message, creates the Parser object (RMParser) which takes the message apart and a validation object is invoked which validates the message. The response is built inside the esql wrapper function after obtaining the necessary information through the stored procedure from the Informix database. The Report Manager creates the RMServerSocket object and sends the GPLA message back to the client.

Having described the functionality of selecting and/or generating a report and customizing it, reference is now had to Figure 7(c) which describes the next step 650 of presenting the user with report run and save options. Particularly, in the preferred embodiment, as shown in each of the customization screens (Figures 9(b)-9(h)), the user may select a save and exit option, depicted in Figure 9(b) as button 322 or a save and run option, depicted in Figure 9(b) as button 323. In either scenario, an WRSEdit object enables a WRSScnMgr object to save the report to the RM server. The WRSScnMgr object launches each screens save method which communicates with the DataManager object to place the screens data in its corresponding WRSNode. Once all of the WRSNode objects have been updated, the WRSScnMgr object calls the DataManager object's SaveReport method to build a hash table to contain all of the report's data. The CommunicationManager utilizes the RptManagerMsg object to create the ARD

metadata message from the hash table, the WRSCommWrapper for direct communication with the backend, and the WRSReportManagerUtilParser to handle any errors thrown by the server. The Report Manager creates the Dispatcher object, and utilizes the services of the RMParser class and validation objects. Upon determining that the client has sent a valid message, the appropriate member function is invoked to service the request. The response is built inside the esql wrapper function after obtaining the necessary information through the stored procedure from the RM database. The Report Manager creates the RMServerSocket object and sends the ARDA message back to the client. When a report is submitted the selected report type and reporting criteria are sent to the Report Manager.

As illustrated in Figure 7(c), at step 655, in reference to user selection of a Save and Run report option, the report is marked as scheduled and saved in a user_table in the Report Scheduler server 260 via the report Manager. Subsequently, as indicated at step 660, the Report Scheduler server 260 sends the ARD message to the fulfilling server which queues the report and runs the report at the specified time(s), as indicated at step 665.

Generally, whether the report is to be currently run for immediate ad hoc reporting, or, is scheduled for normal scheduled reporting, the following sequence of operations, as indicated at steps 670-695, Figures 7(c) - 7(d), are performed: First, in response to receipt of the ARD message, e.g., submitted to the fulfilling server by the Report Scheduler, the fulfilling server completes the report and compresses

the report/data, as indicated at step 670. Then, the report/data is "pushed", implementing FTP, to the fulfilling server's directory on the Inbox server 270, as indicated at step 673. Each application server, e.g., TVS server 500, is responsible for generating unique file names within their directory on the Inbox server 270. For example, the following directory and file naming conventions used for reports generated by the TrafficView server are labeled inbox\files\tvs with text files having the suffix *.txt or *.txt_zip (compressed), and comma separated files having a suffix *.csv or *.csv_zip (compressed). The fulfilling server then verifies that the FTP process was successful, as indicated at step 676, and, at step 679, a notification is sent by the fulfilling server to the Report Manager to notify the Report Manager server 250 of the location of a scheduled report. This is accomplished by using a "NRL" metadata message.

Appendix B provides a table comprising the Notify Report Location parameters used for the NRL Metadata messaging sent by a fulfilling server to the RM Server 250 when a requested report is complete. An example NRL message sent from the TVS server 500 to the RM server 250 is as follows:

```
NRL<TYPE=traffic, ENTPID=00022924, USERID=jeanvnet2,
STDRPTID=25,USERRPTID=699, REQUESTID=32185, COMPRESS=0,
LOC=/inbox/files/testTVS/902507996STDRPTID25.CSV,
FSIZE=198369,REPORT TITLE=Simulated Report Title,
PRESORTED=1, CATEGORY=R>
```

Also provided in Appendix B is the acknowledgment table sent back to the fulfilling server in response.

In the preferred embodiment, the NRL message received by the RM server 250 includes parameters verifying whether or not the FTP process was successful. If it was successful, then the fulfilling server messages the Inbox that the file has been transmitted successfully by transmitting the report name (filename) and location. When the fulfilling server encounters a problem executing a report, a notification is sent to the Report Manager. Particularly, an error flag is placed in the status field of the User_report by the Report Manager which is displayed to the user during Report Request. The error message description will be placed in a text file and FTP'd to the fulfilling server's report location on the Inbox server (e.g., \inbox\files\tvs) by the fulfilling server.

Referring to Figure 7(d), step 679, once the RM server 250 has received the NRL message from the fulfilling server, it verifies the file's presence, as indicated at step 682. The RM server 250 then builds a metadata file, e.g., by compressing the appropriate metadata (for displaying the report) into a .MTD file, as indicated at step 685. This .MTD file is utilized by the Report Viewer to know how to display the report. The Report Manager server creates a file including the metadata using the same file name as the report/data file, but having the following suffix: *.mtd or *.mtd_zip indicating a metadata or compressed metadata file, respectively.

Appendix F details the parameters that are passed in the GET METADATA messaging for indicating to the Report Viewer how to display a requested report. For example, a GET METADATA message corresponding to an unpriced TVS fulfilling server report is as follows:

<METADATA=<CRITERIA=<Name=UsageSummary292^ADescription=This report summarizes calls based on call type.^A Report_Level=<INBOUND<<90000001,90000001><NA,NA><NA,NA>>
INBOUND<<90000002,90000002><,><,>>>^AOptions=^AScheduling_Information=^AOne_Time=^ADates=<06/01/199800:00/~07/01/199800:00,>^ATimezone=EST,Lang=1234,Curr=2345>DEFAULT_GRAPH_MODE=0^ADEFAULT_GRAPH_TYPE=0^ADEFINE_X_AXIS=0^AX_AXIS_COLUMN= ^ADEFAUL T_Y_COLUMNS=<>^A COLUMN_DISPLAY_ORDER=<105^A114^A67^A62^A36^A61^A58^A63^A64^A66^A65>^ASORT_ALLOWED=1^APRESORTED=0^A PRESUBTOTALED=1^ATOTALMODE=0^ASORT_COLUMN S=<105A>^A SUBTOTAL_COLUMNS=<>^ASELECTED_SECTION=0^A METACOLUMN=<META_COLUMN_ID=105^A COLUMN_LABEL=Usage Description^ADATATYPE=S^ADECIMAL=0^A HIDEABLE=1^AGRAPHABLE=0^AWIDTH=20^ACALCULATE=0^A CALCULATE_EXPRESSION=>^AMETACOLUMN=<META_COLUMN_ID=114^A COLUMN_LABEL=Range/DistanceDescription^ADATATYPE=S^ADECIMAL=0^AHIDEABLE=1^AGRAPHABLE=0^AWIDTH=20^ACALCULATE=0^A CALCULATE_EXPRESSION=>^AMETACOLUMN=<META_COLUMN_ID=67^A COLUMN_LABEL=Calls^ADATATYPE=I^ADECIMAL=0^AHIDEABLE=1^A GRAPHABLE=1^AWIDTH=7^ACALCULATE=0^ACALCULATE_EXPRESSION=> ^AMETACOLUMN=<META_COLUMN_ID=62^ACOLUMN_LABEL=% Calls^A

DATATYPE=N^ADECIMAL=1^AHIDEABLE=1^AGRAPHABLE=1^AWIDTH=7
^A
CALCULATE=0^ACALCULATE_EXPRESSION=>^A
METACOLUMN=<META_COLUMN_ID=36^ACOLUMN_LABEL=Minutes^A
DATATYPE=N^ADECIMAL=1^AHIDEABLE=1^AGRAPHABLE=1^AWIDTH=8
^A
CALCULATE=0^ACALCULATE_EXPRESSION=>^A
METACOLUMN=<META_COLUMN_ID=61^ACOLUMN_LABEL=% Min^A
DATATYPE=N^ADECIMAL=1^AHIDEABLE=1^AGRAPHABLE=1^A
WIDTH=5^ACALCULATE=0^ACALCULATE_EXPRESSION=>^A
METACOLUMN=<META_COLUMN_ID=58^ACOLUMN_LABEL=Amount^ADAT
ATYPE=C^ADECIMAL=2^AHIDEABLE=1^A
GRAPHABLE=1^AWIDTH=7^ACALCULATE=0^ACALCULATE_EXPRESSION
=>
^AMETACOLUMN=<META_COLUMN_ID=63^ACOLUMN_LABEL=% Amt^A
DATATYPE=N^ADECIMAL=1^AHIDEABLE=1^AGRAPHABLE=1^AWIDTH=5
^A
CALCULATE=0^ACALCULATE_EXPRESSION=>^A
METACOLUMN=<META_COLUMN_ID=64^ACOLUMN_LABEL=Avg
Min/Call
^ADATATYPE=N^ADECIMAL=2^AHIDEABLE=1^AGRAPHABLE=1^A
WIDTH=12^ACALCULATE=0^ACALCULATE_EXPRESSION=>^A
METACOLUMN=<META_COLUMN_ID=66^ACOLUMN_LABEL=Avg
Amt/Call^A
DATATYPE=N^ADECIMAL=2^AHIDEABLE=1^AGRAPHABLE=1^AWIDTH=1
2
^A CALCULATE=0^ACALCULATE_EXPRESSION=>^A
METACOLUMN=<META_COLUMN_ID=65^ACOLUMN_LABEL=Avg
Amt/Min^A
DATATYPE=N^ADECIMAL=2^AHIDEABLE=1^AGRAPHABLE=1^A
WIDTH=11^ACALCULATE=0^ACALCULATE_EXPRESSION=>>>

```
*<METADATA= <CRITERIA= <Name=My Report,
Total=Totals are located at the bottom of the
report., Description=My report description,
Number_Dialed=<800#1, 800#2, 800#n>,
Scheduling_Information= Recurring, Dates=
Monthly>> DEFAULT_GRAPH_MODE=1,
DEFAULT_GRAPH_TYPE=1, DEFINE_X_AXIS=1,
X_AXIS_COLUMN=2, DEFAULT_Y_COLUMNS=<5,6>,
COLUMN_DISPLAY_ORDER=<1,2,3,4,5,6>,
COLUMN_STORED_ORDER=<4,3,2,5,6,1>, SORT_ALLOWED=1,
PRESORTED = 1, TOTALMODE=3, SUBTOTCOL=<5,6>,
SELECTED SECTION=1, METACOLUMN=<META_COLUMN_ID=1,
COLUMN_LABEL=name, DATATYPE=S, DECIMAL=0,
HIDEABLE=1, GRAPHABLE=0, WIDTH=10, CALCULATE=1,
CALCULATE_EXPRESSION=<4 / 7>>>>
```

Once the metadata file corresponding to the requested report is build by the Report Manager, the RM ftp's the .MTD file to the Inbox server, as indicated at step 688, Figure 7(d). The RM server additionally updates the User_report table status field with a status "C" indicating completion, as indicated at step 691.

Once the Report Manager has updated the status field, the RM server 250 then adds the report to the user's Inbox, as indicated at step 693.

Appendix C provides a table showing the fields for the metadata messaging between the RM server 250 and the Inbox server 270 for adding an item into the StarWRS system Inbox server 270, and the respective acknowledgment message format back from the Inbox server. In the "A" message found in Appendix C, the "LOC" field includes information about where the report

data is located. For example, a metadata message indicating to the Inbox server that an unpriced TVS fulfilling server report is available is shown as:

```
A<CATEGORY=R,TYPE=traffic,REQUESTID=32197,USER
ID=LynneLevy2,RPTID=150,PRIORITY=,COMPRESS=0,U
NOTIFY=0,MMADDR=,MMTEXT=,PGT=,PGPIN=,PGTXT=,RP
TCATEGORY=Service Location & Hour,
LOC=/inbox/files/testTVS/902512294STDRPTID10.C
SV,ENTPID=10324488,RQSTDT=1998-01-02
15:18,FSIZE=3705,RPTTITLE=Summary by Service
Location and Hour,MSIZE=3322>
```

Particularly, the RM server supplies a metadata "A" message to the Inbox indicating the FTP file location. Via the report viewer, the report is now available for viewing, downloading, saving, or printing by the user, as indicated at step 695. Particularly, as shown in the exemplary nMCI home page in Figure 8, the nMCI Interact Message Center icon 293 may be selected which will cause the display of a web page including the message center dialog box 325 such as shown in Figure 10(a). From the dialog box 325, a user may select from among three tabs, a news tab 327, a reports tab 328 and a data tab 329. Selection of the reports tab 329 enables the retrieval of both a data file and a metadata file from the Inbox Server corresponding to those reports that have been run and available for customer viewing. Information provided for display by the message center display 325 is provided by the User_table which keeps track of the status of all reports for a particular user. By double-clicking a chosen report, a report viewer application is enabled

to display the chosen report on a web-page. Figure 10(b) illustrates an example web-page presenting a text viewer screen 335 enabled by selecting the highlighted report 330 in Figure 10(a). Referring back to Figure 6, the Report Viewer 215 interfaces with the user's Inbox 210 for presenting to the customer the various type of reports received at the Inbox. It should be understood that all Report Requestor and Report Viewer applications communicate with the RM server 250 through the use of the common object communication classes.

Particularly, as shown in Figure 6, the Inbox server 270 interface with the Inbox Client 210 supports messaging that enables the User to remove an item from the Inbox, e.g., delete a report, or, to delete all items from the Inbox, e.g., for a particular Enterprise and User ID as well as other associated reports.

Appendix G illustrates the parameters used in the metadata messaging between the Inbox client and the Inbox server. Particularly, the List "L" message is a synchronous request for a list of all Inbox items for a specific user. The Inbox fetch "F" function is a bulk transfer request that enables bulk transfer of the requested file to the Inbox client.

Referring back to Figure 7(b), after editing or modifying an existing report, the user may simply select to save the report and exit. In this case, the ARD message is sent from the Report Requestor client to the RM server and is saved in the RM inventory database for subsequent execution. Consequently, the report is flagged as incomplete in the User_table and may not be run until a run option for that report is chosen.

Otherwise, the report may be immediately scheduled if the user selects the save and run button.

As described, Metadata messaging is used throughout the various components of the StarWRS system 200. The format of an interface message that is sent to the Report Scheduler server is identical to the format as shown in Table 1 as is the interface messaging format returned by the RS server 260 in Table 2. Thus, in the case of automatic recurring reports, a variation of the process outlined in Figure 7(c) occurs at step 660, whereby the ARD request is instead sent from the report scheduler to the fulfilling server at the programmed frequency. Particularly, when a report is required to be run, the Report scheduler server 260 (Figure 6) sends an ARD request to the fulfilling server in a metadata message format having parameters as included in the Add Report Definition table in Appendix D. Upon processing of the metadata message, the fulfilling server will respond to the report Scheduler with an acknowledgment of the command, and the process outlined in Figures 7(c) and 7(d) is executed.

The Report Scheduler server 260 is additionally capable of updating the User_ report status table and, preferably, is provided with a tracking mechanism for tracking the scheduling of user reports. If the report is an Adhoc report, it is marked as inactive in the user report table once the status is complete.

Figure 11(a) illustrates a flow diagram depicting the Report Scheduler process 800 employed for executing scheduled reports as listed in a User_table

maintained by the Report Manager and Report Scheduler servers. Preferably, each of these steps are accomplished by invoking stored procedures within the report scheduler Informix database. As shown in Figure 11(a), the first step 802 is for determining a check point value, which is a specified time used as an index for selecting the reports to be run from the User_report table. Then, at step 804, a determination is made to determine if it is time to run a type of report, e.g., adhoc, hourly, daily, weekly, monthly. If no report needs to be run in the current loop, then the process returns to step 802. If at step 804 it is determined that a report is to be run, then at step 806, a list of user reports that have a date older than the checkpoint date is requested. This list is accessed from the User_report table maintained in the report scheduler Informix database. Then, at step 808, a determination is made as to whether any reports were returned in the request. If no reports were returned, then the process returns back to step 802. If there are reports returned, then at step 810, a determination is made as to whether the customer can still report on the "hierarchies" in the particular report.

Particularly, before the report request is submitted to the fulfilling server, the Report Scheduler server verifies the user access to hierarchy nodes, which verification is done via a direct connection with the StarOE Informix database tables, as indicated at step 812 shown as broken lines in Figure 11(a).

Appendix I provides a list of the stored procedures called by the Report Scheduler process used to validate a user's security level, i.e., node, corp

id, service location. If the StarOE returns false, the hierarchy table is updated accordingly. Particularly, the Report Scheduler server 260 validates the user's hierarchy requests with StarOE prior to sending the ARD to the fulfilling server (e.g., ODS). Any hierarchies that are no longer valid for the user are removed from the ARD and placed in a Hierarchy Notification report (not shown), which is added to the user's inbox.

After determining whether the user can report on the "hierarchies," then, at step 814, a determination is made as to whether the user can perform the report. If the user can not perform this report, e.g., due to a hierarchy conflict, then the report file is FTP'd to the Inbox server reporting that the request can not be performed, as indicated at step 816, and, at step 818, a metadata "A" message is sent to the Inbox from the RS server 260 indicating the FTP file location. Afterward, the process returns to step 802 and the process repeats.

If at step 814 it is determined that the user can perform the report, the process proceeds to step 820, Figure 11(b) where a determination is made as to whether the user can report on any portion of the report. If the user can not report on any portion then the process ends and returns to the report scheduler process at step 802. If the user can report on any portion then at step 822, a request is sent to the fulfilling server to execute that portion of the report that the user is entitled. A determination as to whether there were portions of the report that could not be performed is then made at step 824. If there were portions that could not be reported, a file is FTP'd to the Inbox server at step 826 to report to the

customer that portion of the request that could not be reported. That is, any hierarchies or 800 numbers that are no longer valid for the customer are removed from the ARD and placed in the Hierarchy Notification report, and added to the user's inbox. The Report Scheduler performs the FTP of the report/data file to a known directory on the Inbox server, i.e., a "push" from Report Scheduler to the Inbox. A directory is pre-defined on the Inbox server for the Report Scheduler, e.g., /inbox/files/rs .

Afterwards, at step 828, an "A" message is sent to the Inbox indicating the FTP file location, and the process repeats by returning to step 802. If there were no portions that could not be reported, the process proceeds to step 802.

As mentioned herein with respect to Figure 2, the messages created by the client Java software are transmitted to the StarWeb (DMZ) Server 24 over HTTPS. For incoming (client-to-server) communications, the DMZ Web servers 24 decrypt a request, authenticate and verify the session information. The logical message format from the client to the Web server is shown as follows:

|| TCP/IP || encryption || http || web header || dispatcher header || proxy-specific data ||

where "||" separates a logical protocol level, and protocols nested from left to right. Figure 12 illustrates a specific message sent from the client browser to the desired middle tier server for the

particular application. As shown in Figure 12, the client message 340 includes an SSL encryption header 342 and a network-level protocol HTTP/POST header 344 which are decrypted by the DMZ StarWeb Server(s) 24 to access the underlying message; a DMZ Web header 346 which is used to generate a cookie 341 and transaction type identifier 343 for managing the client/server session; a dispatcher header 345 which includes the target proxy identifier 350 associated with the particular type of transaction requested; proxy specific data 355 including the application specific metadata utilized by the target proxy to form the particular messages for the particular middle tier server providing a service; and, the network-level HTTP/POST trailer 360 and encryption trailer 365 which are also decrypted by the DMZ Web server layer 24.

After establishing that the request has come from a valid user and mapping the request to its associated session, the request is then forwarded through the firewall 25 over a socket connection 23 to one or more decode/dispatch servers 26 located within the corporate Intranet 30. The messaging sent to the Dispatcher will include the user identifier and session information, the target proxy identifier, and the proxy specific data. The decode/dispatch server 26 authenticates the user's access to the desired middle-tier service.

As shown in Figure 12, the StarWeb server forwards the Dispatcher header and proxy-specific data to the Dispatcher, "enriched" with the identity of the user (and any other session-related information) as provided by the session data/cookie mapping, the target proxy identifier and the proxy-specific data. The

dispatch server 26 receives the requests forwarded by the Web server(s) 24 and dispatches them to the appropriate application server proxies. Particularly, as explained generally above with respect to Figure 6, the dispatch server 26 receives request messages forwarded by the DMZ Web servers and dispatches them to the appropriate server proxies. The message wrappers are examined, revealing the user and the target middle-tier service for the request. A first-level validation is performed, making sure that the user is entitled to communicate with the desired service. The user's entitlements in this regard are fetched by the dispatch server from Order Entry server 280 at logon time and cached. Assuming that the Requestor is authorized to communicate with the target service, the message is then forwarded to the desired service's proxy, which, in the accordance with the principles described herein, comprises: 1) a report manager proxy 250' corresponding to the RM Server 250, 2) a report scheduler proxy 260' corresponding to the RS Server 260, and 3) an inbox server proxy 270' corresponding to the Inbox Server 270. Each of these proxy processes further performs: a validation process for examining incoming requests and confirming that they include validly formatted messages for the service with acceptable parameters; a translation process for translating a message into an underlying message or networking protocol; and, a management process for managing the communication of the specific customer request with the middle-tier server to actually get the request serviced. Data returned from the middle-tier server is translated back to client format, if

necessary, and returned to the dispatch server as a response to the request.

Figure 13(a) and 13(b) are schematic illustrations showing the message format passed between the Dispatcher 26 and the application specific proxy (Figure 13(a)) and the message format passed between the application specific proxy back to the Dispatcher 26 (Figure 13(b)). As shown in Figure 13(a), all messages between the Dispatcher and the Proxies, in both directions, begin with a common header 110 to allow leverage of common code for processing the messages. A first portion of the header includes the protocol version 115 which may comprise a byte of data for identifying version control for the protocol, i.e., the message format itself, and is intended to prevent undesired mismatches in versions of the dispatcher and proxies. The next portion includes the message length 120 which, preferably, is a 32-bit integer providing the total length of the message including all headers. Next is the echo/ping flag portion 122 that is intended to support a connectivity test for the dispatcher-proxy connection. For example, when this flag is non-zero, the proxy immediately replies with an echo of the supplied header. There should be no attempt to connect to processes outside the proxy, e.g. the back-end application services. The next portion indicates the Session key 125 which is the unique session key or "cookie" provided by the Web browser and used to uniquely identify the session at the browser. As described above, since the communications middleware is capable of supporting four types of transport mechanisms, the next portion of the common protocol header indicates the message type/mechanism 130 which

may be one of four values indicating one of the following four message mechanisms and types: 1) Synchronous transaction, e.g., a binary 0; 2) Asynchronous request, e.g., a binary 1; 3) Asynchronous poll/reply, e.g., a binary 2; 4) bulk transfer, e.g., a binary 3.

Additionally, the common protocol header section includes an indication of dispatcher-assigned serial number 135 that is unique across all dispatcher processes and needs to be coordinated across processes (like the Web cookie (see above)), and, further, is used to allow for failover and process migration and enable multiplexing control between the proxies and dispatcher, if desired. A field 140 indicates the status is unused in the request header but is used in the response header to indicate the success or failure of the requested transaction. More complete error data will be included in the specific error message returned. The status field 140 is included to maintain consistency between requests and replies. As shown in Figure 13(a), the proxy specific messages 375 are the metadata message requests from the report requestor client and can be transmitted via synchronous, asynchronous or bulk transfer mechanisms. Likewise, the proxy specific responses are metadata response messages 380 again, capable of being transmitted via a synch, asynch or bulk transfer transport mechanism.

It should be understood that the application server proxies can either reside on the dispatch server 26 itself, or, preferably, can be resident on the middle-tier application server, i.e., the dispatcher front end code can locate proxies resident on other servers.

As mentioned, the proxy validation process includes parsing incoming requests, analyzing them, and confirming that they include validly formatted messages for the service with acceptable parameters. If necessary, the message is translated into an underlying message or networking protocol. A list of Report Manager and Inbox proxy error messages can be found in Appendix E. If no errors are found, the proxy then manages the communication with the middle-tier server to actually get the request serviced. The application proxy supports application specific translation and communication with the back-end application server for both the Web Server (java applet originated) messages and application server messages.

Particularly, in performing the verification, translation and communication functions, the Report Manager server, the Report Scheduler server and Inbox server proxies each employ front end proxy C++ objects and components. For instance, a utils.c program and a C++ components library, is provided for implementing general functions/objects. Various C++ parser objects are invoked which are part of an object class used as a repository for the RM metadata and parses the string it receives. The class has a build member function which reads the string which contains the data to store. After a message is received, the parser object is created in the RMDispatcher.c object which is file containing the business logic for handling metadata messages at the back-end. It uses the services of an RMParser class. Upon determining that the client has sent a valid message, the appropriate member function is invoked to service the request. Invocation occurs

in MCIRMServerSocket.C when an incoming message is received and is determined not to be a talarian message. RMSErverSocket.c is a class implementing the message management feature in the Report Manager server. Public inheritance is from MCIServerSocket in order to create a specific instance of this object. This object is created in the main loop and is called when a message needs to be sent and received; a Socket.c class implementing client type sockets under Unix using, e.g., TCP/IP or TCP/UDP. Socket.C is inherited by ClientSocket.C:: Socket(theSocketType, thePortNum) and ServerSocket.C:: Socket(theSocketType, thePortNum) when ClientSocket or ServerSocket is created. A ServerSocket.c class implements client type sockets under Unix using either TCP/IP or TCP/UDP. ServerSocket.C is inherited by RMServerSocket when RMServerSocket is created. An InboxParser.c class used as a repository for the RM Metadata. The class' "build" member function reads the string which contains the data to store and the class parses the string it receives. After a message has been received, the MCIInboxParser object is created in inboxutl.c which is a file containing the functions which process the Inbox requests, i.e, Add, Delete, List, Fetch and Update. Additional objects/classes include: Environ.c which provides access to a UNIX environment; Process.c which provides a mechanism to spawn slave processes in the UNIX environment; Daemon.c for enabling a process to become a daemon; Exception.c for exception handling in C++ programs; and, RMlog.c for facilitating RM logging. In addition custom ESQL code for RM/database interface

is provided which includes the ESQC C interface (Informix) stored procedures for performing the ARD, DRD, DUR, URS, GRD, CRD, GPL, and GRINF messages. The functions call the stored procedures according to the message, and the response is build inside the functions depending on the returned values of the stored procedures. A mainsql.c program provides the ESQL C interface for messages from the report manager and report viewer.

These utilities enable multi-threaded proxy functionality as illustrated in the logic flow diagram 900 of Figures 14(a)-14(c).

Specifically, as shown in Figure 14(a), step 902, a proxy listener socket on a middle-tier server, e.g., report manager server, is first initialized. A proxy signal handler is invoked at step 904 to set all of the signals that the proxy is interested in handling. Then, as indicated at step 905, it waits for a connection signal from the dispatcher server, as indicated at step 905. At step 908, a determination is made as to whether the Proxy has accepted a connection request from the dispatcher. If the proxy could not accept the connection, a SignalHandler Routine is invoked as indicated at step 908 and described with reference to Figure 14(b). If the proxy accepts the connection, a child process is instantiated as indicated at step 910. A determination is next made at step 911 to determine if the forked process was successful. If the forked process was successful, then a check is made at step 912 to determine if the child process was created for that session. If the child process was created, then the child process is invoked

at step 915 as described with reference to Figure 14(c). If the child process was not created, a determination is made at step 916 to determine whether the parent proxy process is still executing. If the parent is still executing, then the current conversation socket is closed, as indicated at step 918, and the process returns to step 905. If the parent is not alive, then an error handler routine is invoked at step 920, and the process returns to step 905.

Returning back to step 908, if the proxy could not accept a connection request, the Signal Handler routine is described with reference to Figure 14(b). As shown at step 922, the SignalHandler routine first blocks all signals except the current signal. Then at step 922 a determination is made at step 924 as to whether the received signal is equal to the "SIGBUS" indicating a bus failure. If the received signal is not equal to SIGBUS, then a determination is made at step 926 as to whether the received signal is equal to the "SIGQUIT", e.g., indicating a quit command. If the received signal is not equal to SIGQUIT, then a determination is made at step 928 as to whether the received signal is equal to the "SIGCHLD". If the received signal is not equal to SIGCHLD, then a determination is made at step 930 as to whether a signal is pending.

If, at step 924, it is determined that the received signal is equal to SIGBUS, then the process quit signal "SIGQUIT" is generated at step 932, and the process returns to step 930. If, at step 926, it is determined that the received signal is equal to "SIGQUIT", then a SignalExit process is invoked to exit

the process, as indicated at step 934, and the process returns to step 930. If, at step 928, it is determined that the received signal is equal to "SIGCHLD", then a CleanupChild process is invoked to free-up the resource that the child process had used, as indicated at step 936, and the process returns to step 930. If none of these signals were generated and no signals are pending, then at step 935 all signals are restored and the process returns to step 905, Figure 14(a).

If it is determined that a signal is pending at step 930, then the process proceeds to step 944. At step 944, a determination is made as to whether the received signal is equal to the SIGBUS indicating a bus error. If the received signal is not equal to SIGBUS, then a determination is made at step 946 as to whether the received signal is equal to the SIGQUIT. If the received signal is not equal to SIGQUIT, then a determination is made at step 948 as to whether the received signal is equal to the SIGCHLD. If the received signal is not equal to SIGCHLD, then the process proceeds to step 935 where all signals are restored and the process returns to step 905, Figure 14(a).

If, at step 944, it is determined that the received signal is equal to SIGBUS, then a SIGQUIT signal is generated at step 952, and the process returns to step 935. If, at step 946, it is determined that the received signal is equal to SIGQUIT, then a SignalExit process is invoked as indicated at step 954, and the process returns to step 935. If, at step 948, it is determined that the received signal is equal to SIGCHLD, then a CleanupChild process is invoked to free up the resource that the child had used, as indicated

at step 956, and the process returns to step 935. If none of these signals were generated all signals are restored at step 935 and the process returns to step 905, Figure 14(a).

Referring back to figure 14(a), the client request is processed by the forked child process as indicated at step 915. This procedure is described with reference to Figure 14(c) where, at step 960, the proxy header is received from the Dispatcher. If the header does not conform to the protocol, then at step 964, an error handling routine is invoked, and the socket connection to the Dispatcher is closed, as indicated at step 968, and the process terminates by returning at step 969 to the invoking procedure (Figure 14(a)). If the header conforms to the messaging protocol as determined at step 962, then a validation step is performed at step 965 wherein a connection to the Web server cookie jar is implemented to determine the validity of the current session. Next, a determination is made at step 970 as to whether the current session is a valid user session. If the current session is validated, then the process proceeds to step 975. Otherwise the process proceeds to step 968 to close the socket connection to the Dispatcher.

At step 975, Figure 14(c), the proxy application receives the metadata message. At step 976, a determination is made as to whether the process proxy application failed. If the proxy process failed, the program will handle the error as indicated at step 978. If there is no error, the proxy application will input processed data from the meta data descriptions as indicated at step 980, and send back the proxy header to the Dispatcher based on the transaction type, as

indicated at step 983. A determination is made at step 985 as to whether an error occurs when sending the proxy header. If an error occurs, the program will handle the error as indicated at step 987 and close the socket connection to the dispatcher server as indicated at step 995. Otherwise, as indicated at step 990, the proxy data obtained from the proxy application is sent to the dispatcher in accordance with the specified transaction mechanism. A determination is made at step 992 as to whether an error occurs when sending the proxy data back to the Dispatcher server. If an error occurs, the program will handle the error as indicated at step 987 and close the socket connection to the dispatcher as indicated at step 995. If the transmission is successful, the socket connection to the Dispatcher server closes, as indicated at step 995 and the process returns to step 905, Figure 14(a), to await the next proxy connection request.

Outgoing (server-to-client) communications follow the reverse route, i.e., the proxies feed responses to the decode/dispatch server and communicate them to the DMZ Web servers over the socket connection. The Web servers will forward the information to the client using SSL. The logical message format returned to the client from the middle tier service is shown as follows:

|| TCP/IP || encryption || http || web response || dispatcher response || proxy-specific response ||

where "||" separates a logical protocol level, and protocols nested from left to right.

The foregoing merely illustrates the principles of the present invention. Those skilled in the art will be able to devise various modifications, which although not explicitly described or shown herein, embody the principles of the invention and are thus within its spirit and scope. For instance, although, the web/Internet reporting system tool described herein is employed for customer's of a telecommunications network, it can be readily implemented for any type of application requiring the secure handling of report requests over the web/Internet and the secure generation and presentation of reports for downloading over the Web/Internet.

APPENDIX A

Retrieve Report Template List

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GRTL	Request	Char (4)	Yes	
PRODUCT=	Product ID	Char (1)	Yes	V, C, S, T, H
DATATYPE=	Data Type	Char (1)	Yes	R = Reports, D = Call Detail A = All data types
DATACAT=	Data Category	Char (1)	Yes	P = Priced, U = Unpriced
IO=	Inbound/Outbound	Char (1)	Yes	I = Inbound, O = Outbound B = Both

Send Report Template List

Message	Parameter Name	Parameter Type	Required	Acceptable Value
SRTL	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
REPORTS=	Data	Char	No	See below formatting

Get Report Template Detail

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GRTD	Request	Char (4)	Yes	
REPORTID=	Standard Report ID	Char (10)	Yes	Report ID (i.e., 2, 44)

Send Report Template Detail

Message	Parameter Name	Parameter Type	Required	Acceptable Value
SRTD	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
ID=	Template ID	Char (10)	Yes	
NODE=	Data	Char		see above formatting

Get User Report List

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GURL	Request	Char (4)	Yes	
USERID=	User ID	Char (20)	Yes	UserID
RPTTMPID=	Report Template ID	Char (10)	Yes	Template ID
ENTPID=	Enterprise ID	Char (8)	Yes	Enterprise ID
PRODUCT=	Product ID	Char (1	Yes	V,C,S,T,H
DATACAT	Data Category	Char (1)	Yes	P = Priced U = Unpriced

Send User Report List

Message	Parameter Name	Parameter Type	Required	Acceptable Value
SURL	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
REPORTS=	Data	Char	No	See above formatting

Get User Report Detail

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GURD	Request	Char (4)	Yes	
REPORTID=	User Report ID	Char (10)	Yes	Report ID (i.e., 245). Limit on unique user report Ids is 2147483647

Send User Report Detail

Message	Parameter Name	Parameter Type	Required	Acceptable Value
SURD	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
ID=	Template ID	Char(10)	Yes	
NODE=	Data	Char		see above formatting

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
ARD	Request	Char (3)	Yes	
USERID=	User's ID	Char (20)	Yes	UserID
ENTPID=	Enterprise ID	Char (8)	Yes	Enterprise ID – require 8 characters
STDRPTID=	Standard Report ID	Char (10)	Yes	Standard Report ID (i.e., 2, 44).
NAME=	User's report name	Char(100)	Yes	User's designated name for this report (e.g., My Longest Calls)
PRODUCT=	Product	Char (1)	Yes	Vnet = V, CVNS = C, Vision = S, Toll Free = T, Broadband = H
CATEGORY=	Report category Description	Char	Yes	Examples are: Analyze Traffic, Standard Report, Telecommunications

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
THRESHOLD =	Record limits	Delimiter	No	holds RECCOUNT, RANKING, DURATION, ANI
RECCOUNT =	Record count	Char (4)	Yes	Maximum amount of records to be returned in the report results. If no threshold is received, the threshold for the standard report will be used.
RANKING=	TVS Ranking	Char (3)	No	# of call ranks to show. If ranking is not passed, the default value will be used.
DURATION=	TVS Duration	Char (4)	No	# for call duration threshold. If duration is not passed, the default value will be used.
ANI=	TVS ANI	Char (3)	No	# of Items in Most Frequent report. If ANI is not passed, the default value will be used.
SCHEDULE=	Report schedule	Char ()	No	If scheduling information is not received, the Report Manager will only store the report. It will not send a request to the fulfilling server. No overlapping dates will be sent in the start/end pairs. A = Adhoc, H = Hourly, D = Daily, W= Weekly, M = Monthly

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
START=	Start report schedule	Char (12)	No	YYYYMMDDhhmm This parameter is only used if the report is Adhoc. There can be multiple start and end dates.
END=	End report schedule	Char (12)	No	YYYYMMDDhhmm This parameter is only used if the report is Adhoc. There can be multiple start and end dates.
RANGETYPE=	Range type picked by the user	Char(1)	Yes if Adhoc	1 = range 0 = discreet
SCHEDTYPE=	Schedule Type picked by the user	Char(1)	Yes	A = Adhoc only R = Recurring only
TIMEZONE=	User's time zone	Char (3)	Yes	User's time zone value as received from StarOE
NDIALED=	Filter	Char	Yes for TVS, No for all others	Number range delimited by ~
BILLING=	Hierarchy	Char	Yes for ODS, and TVS outbound. No for all others	Single or multiple values from billing hierarchy. Must at least include the Corp ID
CARDNO	Card number	Char	No	Single or multiple values
IDAC=	ID/Account Codes	Char	No	Single or multiple values
GEO=	Geographical	Char	No	Single or multiple values from geographical hierarchy.
IACCESS=	Inbound Access	Char	No	Single or multiple values of inbound access codes(Example: 7)

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
OACCESS=	Outbound Access	Char	No	Single or multiple values of outbound access codes (Example: 4)
IDISTRANGE =	Inbound Distance Range	Char	No	Single or multiple values of inbound distance ranges codes(Example: 2)
IUSAGE=	Inbound Usage	Char	No	Single or multiple values of inbound usage (Examle: 5)
ODISTRANGE=	Outbound Distance Range	Char	No	Single or multiple values of outbound distance ranges (Example: A)
OUSAGE=	Outbound Usage	Char	No	Single or multiple values of outbound usage (Example:2) I
SORTBY=	Sort Order	Char	No	If sort order is not received, sort order for standard report will be used. If sort order is passed, it must be a column ID and descending or ascending order (i.e., 1A).
DESCRIPTION=	Description	Char	No	user's report description. If no description is received, the description for the standard report will be used.
COLUMNS=	Columns	Char	No	These are the columns the user wants in their report. Field Ids are to be passed here (i.e., 5~17~23~44). Use default if not passed.
ACTIVE=	Indicates whether or not the report is scheduled	Char (1)	No	Save only = 0, Schedule = 1, 0 is the default.

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
DURRANGE =	Duration Range	Char	No	Single or multiple values from the duration pick list
TOTALMODE=	Totals or subtotals required based on user selection	Char (1)	No	0 = None (default), 1 = Subtotal, 2 = Total, 3 = Both.
SUBTOTCOL =	Indicates which columns the user wants subtotals on	Char (20)	Yes if TOTALMODE is 1 or 3.	Columns to be subtotaled
MMADDR=	Email address	Char(75)	No	Text
MMTEXT=	Message	Char(500)	No	Text
PGT=	Pager System	Char(15)	No	Pager System
PGPin=	Pager Pin	Char(8)	No	Pin Number
PGTxt=	Message	Char(240)	No	Text
EMAIL=	Indicates if user picked email.	Char(1)	Yes	0 = no, 1 = yes
PAGE=	Indicates if User picked page	Char(1)	Yes	0 = no, 1 = yes
LANG=	Indicates the language a user picked.	Char(4)	No	Default will be American English, the values are not defined.
CURR=	Indicates the language a user picked	Char(4)	No	Default will be American Dollar, the values are not defined.

Add Report Definition Acknowledgment

Message	Parameter Name	Param Type	Required	Acceptable Value
ARDA	Response	Char (4)	Yes	
ERROR=	Error Code:	Char (4)	Yes	0 or error
USERRPTID =	User ReportID	Char (10)	No	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647.

Delete Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
DRD	Request	Char (3)	Yes	
USERID=	User's ID	Char (20)	Yes	UserID
USERRPTID =	User Report ID	Char (10)	Yes	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647

Delete Report Definition Acknowledgment

Message	Parameter Name	Param Type	Required	Acceptable Value
DRDA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
USERRPTID =	User Report ID	Char (10)	No	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647

Copy Report Definition

Message	Parameter Name	Parameter Type	Required	Acceptable Value
CRD	Request	Char (3)	Yes	
USERRPTID =	User Report ID	Char (10)	No	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647
NAME=	User report name	Char (50)	Yes	User report name

Copy Report Definition Acknowledgment

Message	Parameter Name	Parameter Type	Required	Acceptable Value
CRDA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
USERRPTID =	User Report ID	Char (10)	No	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647

Update Report Status

Message	Parameter Name	Param Type	Required	Acceptable Value
URS	Request	Char (3)	Yes	
USERRPTID =	User Report ID	Char (10)	No	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647
ACTIVE	User Active	Char(1)	Yes	0 - for saved/not scheduled 1 - for scheduled

Update Report Scheduling Acknowledgment

Message	Parameter Name	Parameter Type	Required	Acceptable Value
URSA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
USERRPTID =	User Report ID	Char (10)	No	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647

Get Pick List – Access

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Request	Char (3)	Yes	
PL_ACCESS=	Pick List Type	Character	Yes	PL_ACCESS
IO=	Inbound/Outbound	Char (1)	Yes	I=Inbound, O=Outbound,
PRODUCT=	Product	Char (1)	Yes	T=Toll Free, V = Vnet, S = Vision, C = CVNS, H = Broadband
DATACAT=	Data Category	Char (1)	Yes	U = Unpriced, P = Priced, B = Both

Get Pick List Acknowledgement – Access

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_ACCESS=	Pick List Type	Character	Yes	Access code, Description

Get Pick List – Fields

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (3)	Yes	
PL_FIELDS	Pick List Type	Character	Yes	PL_FIELDS
RPTTMPID=	Report Template ID	Char (10)	Yes	

Get Pick List Acknowledgement – Fields

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_FIELDS=	Pick List Type	Character	Yes	FieldID, FieldHeader, FieldColumnHide, FieldSort

Get Pick List – Duration

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (3)	Yes	Single or Multiple Values
PL_DURATION	Pick List Type	Character	Yes	PL_DURATION

Get Pick List Acknowledgement – Duration

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	Single or
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_DURATION= example	Pick List Type	Character	Yes	Duration

Get Pick List – Time Zone

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (3)	Yes	
PL_TIMEZONE	Pick List Type	Character	Yes	PL_TIMEZONE

Get Pick List Acknowledgement – Time Zone

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_TIMEZONE=	Pick List Type	Character	Yes	TimeZoneCode , Description

Get Pick List – Billing Hierarchy

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (3)	Yes	
PL_HIER	Pick List Type	Character	Yes	PL_HIER
USERRPTID=	User Report ID	Char (10)	Yes	User report ID

Get Pick List Acknowledgement – Billing Hierarchy

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_HIER-	Pick List Type	Character	Yes	hierarchy data

Get Pick List – Geographical Hierarchy

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (3)	Yes	
PL_GEO	Pick List Type	Character	Yes	PL_GEO
USERRPTID=	User Report ID	Char (10)	Yes	User report ID

Get Pick List Acknowledgement – Geographical Hierarchy

Message	Parameter Name	Parameter Type	Required	Acceptable Value

Get Pick List – Static Range

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (3)	Yes	
ERRQR=	Error Code	Char (4)	Yes	0 or error
PL_RANGE	Pick List Type	Character	Yes	PL_RANGE
IO=	Inbound/Outboun d	Char (1)	Yes	I=Inbound, O=Outbound,
PRODUCT=	Product	Char (1)	Yes	T=Toll Free, V = Vnet, S = Vision, C = CVNS, H = Broadband
DATACAT=	Data Category	Char (1)	Yes	U = Unpriced, P = Priced, B = Both

Get Pick List Acknowledgment – Static Range

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_RANGE=	Pick List Type	Character	Yes	range code, description

Get Pick List – Static Usage

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (3)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_USAGE	Pick List Type	Character	Yes	PL_USAGE
IO=	Inbound/Outboun d	Char (1)	Yes	I=Inbound, O=Outbound,
PRODUCT=	Product	Char (1)	Yes	T=Toll Free, V = Vnet, S = Vision, C = CVNS, H = Broadband

Get Pick List Acknowledgment – Static Usage

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_USAGE=	Pick List Type	Character	Yes	usage code, description

Get Pick List – Language

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_LANG=	Pick List Type	Character	Yes	Language code

Get Pick List Acknowledgment -Language

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_LANG=	Pick List Type	Character	Yes	Row information to follow

Get Pick List – Currency

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPL	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_CURR=	Pick List Type	Character	Yes	Currency code

Get Pick List Acknowledgment -Currency

Message	Parameter Name	Parameter Type	Required	Acceptable Value
GPLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
PL_CURR=	Pick List Type	Character	Yes	Row information to follow

APPENDIX B

Notify Report Location

Message	Parameter Name	Param Type	Required	Acceptable Value
NRL	Request	Char (3)	Yes	
TYPE=	Designates report type, call detail type, or news type	Char (30)	Yes	e.g. Broadband, priced, real-time, exception, invoice, MIR, CCID, priced call detail, outage
ENTPID=	Enterprise ID	Char (8)	Yes	Enterprise ID
USERID=	User's ID	Char (20)	Yes	UserID
STDRPTID=	Standard Report ID	Char (10)	Yes	Standard Report ID (i.e., 2, 44).
USERRPTID =	User Report ID	Char (10)	Yes when fulfilling server is using the StarWRS Report Requester	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647
REQUESTID =	Unique Request ID	Char (10)	Yes when fulfilling server is using the StarWRS Report Requester	Unique request ID sent to fulfilling server in ARD. Limit on request ID is 2147483647.
PRIORITY=	Standardized Network Management Priority Levels	Char (1)	ONLY news	1 = fatal, 2 = major, 3 = minor, 4 = info(default), 5 = no alert
COMPRESS =	Designates whether the data has been compressed	Char (1)	Yes	0 = data not compressed, 1 = data compressed
LOC=	Location	Char (255)	Yes	File Path, name and extension
FSIZE=	Size of associated file in bytes	Char (10)	Yes	Limit is 2147483647
REPORTTITLE=	Report Title	Char (100)	Yes when fulfilling server is not using the StarWRS	Report title to be displayed in Inbox.

Notify Report Location

Message	Parameter Name	Param Type	Required	Acceptable Value
			Report Requester	
PRESORTED=	Indicates whether or not the fulfilling server sorted the data on their side.	Char (1)	Yes	0 = not presorted, 1 = is presorted.
ERR=	Used to when there is no report file, but there is an informational file.	Char (1)	No	ERR=1 or ERR=0
TOTAL=	Fulfilling server totals	Char	No	Sent by fulfilling server to indicate report totals. Column ID and total are passed.
CATEGORY=	Report, call detail, or news	Char (1)	Yes for StarOE. Report Manager will determine for fulfilling servers.	R = Report, D = Call Detail, F = News

Notify Report Location Acknowledgement

Message	Parameter Nae	Param Type	Required	Acceptable Value
NRLA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
USERID=	User ID	Char (20)	Yes	User ID
USERRPTID=	User Report ID	Char (10)	Yes	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647
REQUESTID=	Unique Request ID	Char (10)	Yes when fulfilling server is using the StarWRS Report Requester	Unique request ID sent to fulfilling server in ARD. Limit on request ID is 2147483647.

APPENDIX C

Add

Message	Parameter Name	Param Type	Required	Acceptable Value
A	Add request	Char (1)	Yes	A = add
SEV=	Servity of notification message	Char (1)	No	1, 2, or 3
CATEGORY=	Item category is an report, call detail, or news	Char (1)	Yes	R = Report, D = Call Detail, F = News
TYPE=	Designates report type, call detail type, or news type	Char (30)	Yes	e.g. Broadband, priced, unpriced, exception, invoice, MIR, CCID, priced call detail, outage
USERID=	Designates intended recipient or audience	Char (20)	Yes	Starbucks username as assigned in StarOE
RPTID=	User report ID	Char (30)	Reports and data only	User report ID (i.e., 245)
PRIORITY=	Standardized Network Management Priority Levels	Char (1)	ONLY news	1 = fatal, 2 = major, 3 = minor, 4 = info (default), 5 = no alert
COMPRESS =	Designates whether the data has been compressed	Char (1)	Yes	0 = data not compressed, 1 = data compressed
UNOTIFY=	Says if user should be paged or emailed when the Inbox item is received by the Inbox server-	Char (1)	No	0 = None (default), 1 = Page, 2 = Email, 3 = Email and page
MMADDR	Override email address	Char(75)	No	Must contain @ e.g. userA@mci.com
MMTEXT	Override email message text	Char(500)	No	
PGT	Override pager type	Char(1)	No	As supported by Star_OE
PGPIN	Override pager PIN	Char(8)	No	Numerics only
PGTXT	Override pager	Char(240)	No	Alphanumeric pagers

Add

Message	Parameter Name	Param Type	Required	Acceptable Value
	text	or Char(20)		or Numeric pagers
RPTCATEGORY=	Report category (report name)	Char (50)	ONLY report	e.g. – Longest Calls
LOC=	Location	Char (255)	Yes	File Path, name and extension
ENTPID=	Enterprise ID	Char (8)	Yes	As assigned in StarOE
RQSTDT=	Report or data request date/time stamp	Char (12)	ONLY report or data	YYYY-MM-DD HH:MM
FSIZE=	Size of associated file in bytes	Char (10)	Yes	Limit is 2147483647
RPTTITLE=	User-defined report title, call detail request name, or news short text	Char (255)	Yes	Example: "Call Duration Summary"
MSIZE=	Size of associated metadata for transfer	Char (10)	ONLY report or data	Limit is 2147483647
ERRFLAG=	Fulfilling server reported an error	Char (1)	No	0 = no error (default), 1 = error

Add Acknowledgment

Message	Parameter Name	Param Type	Required	Acceptable Value
Z	Response	Char (1)	Yes	Z
REQ=	Request which is being acknowledged	Char (1)	Yes	A, D, L, F, U
ERROR=	Error Code	Char	Yes	0 = no error or error code
INBOXID=	Inbox ID	Char(10)	No	Uniquely assigned id

APPENDIX D

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
ARD	Request	Char (3)	Yes	
ENTPID=	Enterprise ID	Char (8)	Yes	Enterprise ID
USERID=	User's ID	Char (20)	Yes	UserID
STDRPTID=	Standard Report ID	Char (10)	Yes	Standard Report ID (i.e., 2, 44).
USERRPTID =	User's Report ID	Char (10)	Yes	User Report ID (i.e., 345). Limit on unique user report IDs is 2147483647.
REQUESTID =	Unique Request ID	Char (10)	Yes	Unique Request ID. Limit is 2147483647
PRODUCT=	Product	Char (1)	Yes	Vnet = V, CVNS = C, Vision = S, Toll Free = T, Broadband = H
THRESHOLD =	Record limits	Delimiter	Yes	RECCOUNT, RANKING, DURATION, ANI
RECCOUNT =	Record count	Char (10)	No	Maximum amount of records to be returned in the report results. If no threshold is received, the default reccount threshold from the report template will be passed.
RANKING=	TVS Ranking	Char (3)	No	# of call ranks to show. If ranking is not passed, the default value will be passed. This is a TVS only parameter. Range is 1-400.

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
DURATION=	TVS Duration	Char (4)	No	# for call duration threshold. If duration is not passed, the default value will be passed. This is a TVS only parameter. Format is mmss. Range is 1-5959.
ANI=	TVS ANI	Char (3)	No	# of Items in Most Frequent report. If ANI is not passed, the default value will be used. This is a TVS only parameter. Range is 1-400.
COLUMNS=	Columns	Char	Yes	These are the columns the user wants in their report. Field Ids are to be passed here (i.e., 5,17, 23,44).
FILTERS=	Filters or Criteria	Delimiter	Yes for	Contains multiple filters (i.e., NDIALED). If filters are not received, filters from the standard report template (if any) will be stored and/or sent with request to fulfilling server.
NDIALED=	Filter	Char	Yes for TVS, no for all others	Number range
BILLING=	Hierarchy	Char	Yes for ODS, Yes for TVS Vision and VNET Outbound	Single or multiple values from billing hierarchy. Must at least include the Corp ID
DURRANGE=	Duration Range.	Char	No	Single or multiple values.

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
CARDNO=	Card Number	Char	No	Single or multiple values from the duration pick list
IDISTRANGE=	Inbound Range	Char	No	Single or multiple values from the Range pick list
ODISTRANGE=	Outbound Range	Char	No	Single or multiple values from the Range pick list
IUSAGE=	Inbound Usage	Char	No	Single or multiple values from the Usage pick list
OUSAGE=	Outbound Usage	Char	No	Single or multiple values from the Usage pick list
IDAC=	ID/Account Codes	Char	No	Single or multiple values
GEO=	Geographical	Char	No	Single or multiple values from geographical hierarchy.
IACCESS=	Inbound Access	Char	No	Single or multiple values of inbound access items
OACCESS=	Outbound Access	Char	No	Single or multiple values of outbound access items
SORTBY=	Sort Order	Char	Yes	If sort order is not received, sort order for standard report will be used. If sort order is passed, it must be a column ID and ascending (A) or descending (D) (i.e., 1D).
TIMEZONE=	Timezone info.	Delimiter	Yes	LABEL and OFFSET.
LABEL=	Time description	Char (3)	Yes	Timezone label (ie, MST).

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
OFFSET=	GMT offset	Char (5	Yes	User's Time Zone in relation to GMT e.g. +2, -5. Valid range is –12 through +13. Offsets will be in 1 hour increments for the 98.1 release.
SCHEDULE=	Report schedule	Char ()	Yes	The Report Scheduler will not send a request to the fulfilling server if the report was not scheduled. A = Adhoc, H = Hourly, D = Daily, W= Weekly, M = Monthly
START=	Start report schedule	Char (12)	Yes	YYYYMMDDhhmm This parameter is only used if the report is Adhoc. These can be multiple start and end dates. Start and end times must be passed in pairs and will be in GMT format.
END=	End report schedule	Char (12)	Yes	YYYYMMDDhhmm This parameter is only used if the report is Adhoc. There can be multiple start and end dates. Start and end times must be passed in pairs and will be in GMT format.
TOTALMODE=	Total mode the user selected.	Char (1)	Yes for ODS, No for all other fulfilling servers.	0 = None (default), 1 = Subtotal, 2 = Total, 3 = Both.

Add Report Definition

Message	Parameter Name	Param Type	Required	Acceptable Value
SUBTOTCOL =	Subtotal columns	Char	Yes if TOTALMODE is 1 or 3.	Subtotal column IDs.

Add Report Definition Acknowledgment

Message	Parameter Name	Param Type	Required	Acceptable Value
ARDA	Response	Char (4)	Yes	
ERROR=	Error Code	Char (4)	Yes	0 or error
USERRPTID =	User Report ID	Char (10)	No	User Report ID (i.e., 245). Limit on unique user report Ids is 2147483647. Please use this token whenever possible. The only time it should not be used is when the fulfilling server cannot parse the message at all.
REQUESTID =	Unique Request ID	Char (10)	Yes	Request ID. Limit is 2147483647.

APPENDIX E

Report Manager Proxy Codes

Error Code	Error Description
0	OK – request processed successful, response includes any data requested
6050	Retransmission on NRLA
6101	General failure
6102	Failure with parser building parameters
6103	Parameter error – missing, etc.
6104	No valid request
6105	Database connectivity error
6106	Database command error
6107	Report Manager ID error
6108	Error opening file
6109/7000	no records found meeting criteria
6110	SQL cannot connect
6111	Cannot execute stored procedure
6112	SQL open cursor
6113	Enterprise ID or user report title empty
6114	Required parameters are missing
6115	IDs are not correct
6116	FF not correct
6600	Report title is null
6601	Number dialed is null
6602	Start date is null
6603	End date is null
6610	Token is unknown
6611	Empty or incorrect input string
6612	Unbalanced brackets
6701	Required tokens missing
6702	Missing parameter value
6703	Required tag in message has no value.
6704	Category cannot be empty.
6705	Range type cannot be empty if sched type neq adhoc.
6706	Enterprise id length is invalid - check config.rm for ENTPID_LEN
6707	Fulfilling server returned a response that appears to be incorrect.
6801	Missing ACTIVE parameter
6802	ACTIVE parameter missing value
6803	Missing CATEGORY parameter
6804	CATEGORY parameter missing value
6805	Missing COMPRESS parameter
6806	COMPRESS parameter missing value
6807	Missing DATACAT parameter
6808	DATACAT parameter missing value
6809	Missing DATATYPE parameter
6810	DATATYPE parameter missing value
6811	Missing DESCRIPTION parameter
6812	DESCRIPTION parameter missing value
6813	Missing EMAIL parameter
6814	EMAIL parameter missing value
6815	Missing ENTPID parameter

6816	ENTPID parameter missing value
6817	Missing FSIZE parameter
6818	FSIZE parameter missing value
6819	Missing FULSERVER parameter
6820	FULSERVER parameter missing value
6821	Missing LOC parameter
6822	LOC parameter missing value
6823	Missing NAME parameter
6824	NAME parameter missing value
6825	Missing PAGE parameter
6826	PAGE parameter missing value
6827	Missing PRODUCT parameter
6828	PRODUCT parameter missing value
6829	Missing REPORTID parameter
6830	REPORTID parameter missing value
6831	Missing RPTTMPLID parameter
6832	RPTTMPLID parameter missing value
6833	Missing SCHEDTYPE parameter
6834	SCHEDTYPE parameter missing value
6835	Missing STDRPTID parameter
6836	STDRPTID parameter missing value
6837	Missing TYPE parameter
6838	TYPE parameter missing value
6839	Missing USERID parameter
6840	USERID parameter missing value
6841	Missing USERRPTID parameter
6842	USERRPTID parameter missing value

Inbox Proxy Codes

Error Code	Error Description
0	OK – request processed successful, response includes any data requested
5005	item had already been added to the inbox and will not be added again.
5100	No records found (status code).
5101	Failure in parser building parameter list, unknown or invalid token may have been encountered.
5102	Required parameter missing
5103	Request is invalid or unknown.
5104	During Fetch request, the file specified in the Inbox database could not be opened
5105	Could not make an SQL connection to the Inbox database
5106	Error occurred trying to execute the stored procedure
5107	Error occurred during an SQL open cursor call
5108	Error occurred trying to construct the filename for a Fetch metadata request
5111	Parameter (Inboxid or Userid) missing on update command.
5112	TTL missing or invalid on Update
5113	Category missing on Update.
5121	InboxID parameter missing in Fetch.
5125	no records found for deletion by stored procedure
5131	UserID parameter missing in List.
5132	Category missing in List.
5141	UserID parameter missing in Delete.

5151	Category parameter invalid in Add.
5152	Type parameter invalid in Add.
5153	EntpID+UserID parameter missing or invalid in Add.
5154	RptID parameter missing in Add.
5155	Compress parameter missing in Add.
5156	Sev parameter missing when Unotify specified in Add.
5157	RptCategory (report name) parameter missing in Add.
5158	Loc parameter missing in Add.
5159	Requested date parameter missing in Add.
5160	Fsize parameter missing in Add.
5161	RptTitle parameter missing in Add.
5162	Msize parameter missing in Add for Report or Data.
5163	File as specified in Loc parameter does not exist.
5164	EntpID parameter missing when Unotify specified.
5165	COMP and LOC parameters conflict, e.g. compress indicated but extension does not end with _zip.
5166	metadata file does not exist.
5170	User notification error – used in conjunction with 5171, 5172, 5174
5171	No user or enterprise ID in user notification
5172	Notification level is null
5174	Unknown notification level
5178	Invalid constructor call in user notification
5179	Invalid email address (no @ symbol) in user notification
5180	No address or text exists in user notification for email
5182	Page could not be sent – required fields missing in user notification
5183	Comm failure in trying to obtain default email/paging info
5184	StarOE returned an error when trying to obtain default email/paging info
5185	Error when attempting to fork a child process in email/paging

APPENDIX F

Get Metadata

Message	Parameter Name	Parameter Type	Required	Acceptable Value
METADATA=	Delimiter	Char	Yes	
CRITERIA=	Delimiter	Char	Yes	
Name=	Name of report	Char(100)	Yes	Name of report
Total_Inbound_Amount=	Total inbound amount	Char	No	Column ID and Total passed in by fulfilling server in NRL.
Total_Outbound_Amount=	Total outbound amount	Char	No	Column ID and total passed in by fulfilling server in NRL
Total_Amount=	Total of inbound and outbound	Char	No	Column ID and total passed in by fulfilling server in NRL
Total_Inbound_Minutes=	Total inbound minutes	Char	No	Column ID and total passed in by fulfilling server in NRL
Total_Outbound_Minutes=	Total outbound minutes	Char	No	Column ID and total passed in by fulfilling server in NRL
Total_Minutes=	Total of inbound and outbound	Char	No	Column ID and total passed in by fulfilling server in NRL
Total_Inbound_Calls=	Total outbound calls	Char	No	Column ID and total passed in by fulfilling server in NRL
Total_Outbound_Calls=	Total inbound calls	Char	No	Column ID and total passed in by fulfilling server in NRL
Total_Calls=	Total of inbound and outbound	Char	No	Column ID and total passed in by fulfilling server in NRL
Total=	TVS total	Char	Yes if TVS, No for all	If fulfilling server is TVS insert text

Get Metadata

			others	"Totals are located at the bottom of the report."
Description=	Description of report.	Char (100)	Yes	Description of report truncated to 100 characters
Report_Level=	Report level selected for this report	Char	Yes	All Levels, Service Group, Billing Group, etc.
Options=	Option line			No values will be displayed with this.
Supp_Code=	Supplemental Codes selected by customer	Char	No	List of supplemental codes if selected.
Access_Type=	Access type selected	Char	No	Dial 1, Card, etc.
Card_Number=	Card numbers selected by customer	Char	No	List of card numbers
ID/Accounting_Codes=	IDACs selected by customer	Char	No	List of IDACs if selected.
Number_Dialed=	Number dialed	Char	No	800 number(s)
Range=	Ranges selected by customer	Char	No	List of ranges
Usage=	Usages selected by customer	Char	No	List of usages
Scheduling_Information=	Scheduling line			No values will be displayed with this
One_Time= Or Recurring=	Schedule type selected by customer	Char	Yes	If recurring no values will be displayed with this. If one time, show the multiple start and end dates
Dates=	Start and end dates if one time report or recurring type if recurring	Char	Yes	Start and end dates if one time or recurring type if recurring
Time_zone=	Time zone	Char	Yes	Time zone – either default or

Get Metadata

				overridden value (MST)
Lang=	Indicates the language a user picked.	Char(4)	No	Default will be American English, the values are not defined.
Curr=	Indicates the language a user picked	Char(4)	No	Default will be American Dollar, the values are not defined.
DEFAULT_GRAPH_MODE=	Default graph mode	Char (1)	Yes	0 = None, 1 = Graph, 2 = Plot
DEFAULT_GRAPH_TYPE=	Default graph type	Char (1)	Yes	0 = None, 1 = Bar, 2 = Line, 3 = Pie, 4 = Point
DEFINE_X_AXIS	Define default x axix	Char (1)	Yes	0 = No, 1 = Yes
X_AXIS_COLUMN=	X axis column	Char	If define_x_axis is Yes	X axis column ID
DEFAULT_Y_COLUMN=	Default Y column	Char	No	List of column IDs for y axis
COLUMN_DISPLAY_ORDER=	Column display order	Char	Yes	List of column IDs to display in a particular order
COLUMN_STORED_ORDER	Column stored order	Char	Yes	Order columns are in default template
SORT_ALLOWED	Sort allowed on viewer	Char (1)	Yes	0 = No, 1 = Yes
PRESORTED.	Presorted by fulfilling server	Char (1)	Yes	0 = No, 1 = Yes
TOTALMODE=	Total mode	Char (1)	Yes	0 = None, 1 = subtotal, 2 = total, 3 = both
SUBTOTCOL=	Subtotal columns	Char	Yes if TOTALMOD is 1 or 3	List of column IDs
SELECTED_SECTION=	Pick list on a certain column	Char (1)	Yes	0 = No, 1 = Yes. If Yes, SUBTOTCOL must contain information

Get Metadata

METACOLUMN=	Delimiter			
META_COLUMN_ID=	Column ID	Char	Yes	Column ID
COLUMN_LABEL=	Column header	Char	Yes	Column header
DATATYPE=	Data type	Char	Yes	Indicates the way the data is received from fulfilling server. S = string, C = character, I = integer, N = number, D = double, L = long
DECIMAL=	Decimal point	Char	No	Number of decimal points
HIDEABLE=	Column can be hidden on viewer	Char (1)	Yes	0 = No, 1 = Yes
GRAPHABLE=	Column can be graphed on viewer	Char (1)	Yes	0 = No, 1 = Yes
WIDTH=	Default column display width	Char	Yes	Default column display width
CALCULATE=	Determines if viewer should calculate the column	Char (1)	Yes	0 = No, 1 = Yes
CALCULATE_EXPRESSION=	Calculation expression	Char	If CALCULATE is Yes	Calculation expression using column IDs.

APPENDIX G

Delete Item

Message	Parameter Name	Param Type	Required	Acceptable Value
D	Request	Char (1)	Yes	D = Delete
INBOXID=	Unique Inbox ID	Char(10)	Yes	ID assigned by Inbox to uniquely identify the item to be deleted

Delete Acknowledgment

Message	Parameter Name	Param Type	Required	Acceptable Value
Z	Response	Char (1)	Yes	Z
REQ=	Request which is being acknowledged	Char (1)	Yes	D
ERROR=	Error Code	Char(4)	Yes	0 = no error, else error code

Delete All Items

Message	Parameter Name	Param Type	Required	Acceptable Value
D	Request	Char (1)	Yes	D = Delete
USERID=	User ID	Char (20)	Yes	User ID
ENTPID=	Enterprise ID	Char (8)	Yes	Enterprise ID

Delete Acknowledgment

Message	Parameter Name	Param Type	Required	Acceptable Value
Z	Response	Char (1)	Yes	Z
REQ=	Request which is being acknowledged	Char (1)	Yes	D
ERROR=	Error Code	Char(4)	Yes	0 = no error, else error code

List

Message	Parameter Name	Param Type	Required	Acceptable Value
L	Request	Char (1)	Yes	L = List
ENTPID=	Enterprise ID	Char (8)	Yes	Enterprise ID
USERID=	User ID owning item	Char (20)	Yes	As assigned by StarOE
CATEGORY=	Inbox item category to return	Char (1)	Yes	R = Report, D – Call Detail, F = News
INBOXID=	Latest Inbox ID in Inbox	Char (25)	No	Inbox Id to return entries later than

List Acknowledgment

Message	Parameter Name	Param Type	Required	Acceptable Value
Z	Response	Char (1)	Yes	Z
REQ=	Request which is being acknowledged	Char (1)	Yes	L
ERROR=	Error Code	Char(4)	Yes	0 – no error, else error code
INBOXID	Latest Inbox ID requested	Char (25)	No	Supplied Inbox ID on request
TTL=	Time to Live	Char (3)	No	"Time to live" in days – before automatically purged from dbf. Default is 45 days.
<data>	data	Char	No	see format below

Fetch

Message	Parameter Name	Param Type	Required	Acceptable Value
F	Request	Char (1)	Yes	F = Fetch
INBOXID=	ID assigned by Inbox to uniquely identify the item to be located	Char	Yes	

Update

Message	Parameter Name	Param Type	Required	Acceptable Value
U	Operation flag – update request	Char (1)	Yes	U = Update
ENTPID=	Enterprise ID	Char (8)	Yes	Enterprise ID
USERID=	User ID owning item	Char (20)	Yes	As assigned by StarOE
INBOXID=	Inbox unique ID	Char ()	Yes	ID assigned by Inbox to uniquely identify the item to be located
TTL=	Time to Live	Char (3)	No	"Time to live" in days – before automatically purged from dbf. Default is 45 days.
ACK=	Acknowledge item	Char (1)	No	0 = not acknowledged 1 = acknowledge item (default)

Update Acknowledgment

Message	Parameter Name	Param Type	Required	Acceptable Value
Z	Request	Char (1)	Yes	Z
REQ=	Request which is being acknowledged	Char (1)	Yes	U
ERROR=	Error Code	Long	Yes	0 – no error, else error code

APPENDIX H

Interface Message with Platform

COSharedClientSession	getClientSession	Returns the user's client session.	COClientSession
COClientSession	getUser	Returns the user's entitlements from StarOE.	COUser
COUser	getTimeZone	Returns an id code from StarOE that represents the default Time Zone for the user.	Id string that represents a user's default timezone. The return must be a number. For example, "48" represents US Mountain Time.
COUser	getCurrency	Returns parameter from StarOE that represents the default Currency for the user. (for 98.4 only American Dollars are supported).	ID string that represents a user's default currency. Currently, the id's are undefined.
COUser	getLanguage	Returns parameter from StarOE that represents the default language for the user. (for 98.4 only American English is supported).	Id string that represents a user's default language. Currently, the id's are undefined

Interface Message with StarOE - Overall Security

OEReportingSecRqst	doIt	Retrieves StarOE security flags	OEReportingSecRsp
OEReportingSecRsp	getReportingSec	Returns an object that contains all security flags	OEReportingSec

Data Response from StarOE - Overall Security

OEReportingSec	tollFreeRpts	An object that contains all Tollfree flags
OEReportingSec	visionRpts	An object that contains all Vision flags
OEReportingSec	vnetRpts	An object that contains all VNET flags
tollFreeRpts	unpricedRpt	Y = unpriced Tollfree standard reports on N = unpriced Tollfree standard reports off
tollFreeRpts	unpricedException	Y = unpriced Tollfree exception reports on N = unpriced Tollfree exception reports off
tollFreeRpts	unpricedCDR	Y = unpriced Tollfree call detail reports on N = unpriced Tollfree call detail reports off
tollFreeRpts	pricedRpt	Y = priced Tollfree reports on N = priced Tollfree reports off
tollFreeRpts	pricedCDR	Y = priced Tollfree call detail reports on N = priced Tollfree call detail reports off
visionRpts	unpricedRpt	Y = unpriced Vision standard reports on N = unpriced Vision standard reports off
visionRpts	unpricedException	Y = unpriced Vision exception reports on N = unpriced Vision exception reports off
visionRpts	unpricedCDR	Y = unpriced Vision inbound call detail reports on N = unpriced Vision inbound call detail reports off
visionRpts	outboundCDR	Y = unpriced Vision outbound call detail reports on N = unpriced Vision outbound call detail reports off
visionRpts	pricedRpt	Y = priced Vision reports on N = priced Vision reports off
visionRpts	pricedCDR	Y = priced Vision call detail reports on N = priced Vision call detail reports off
vnetRpts	unpricedRpt	Y = unpriced VNET standard reports on N = unpriced VNET standard reports off
vnetRpts	unpricedException	Y = unpriced VNET exception reports on N = unpriced VNET exception reports off
vnetRpts	unpricedCDR	Y = unpriced VNET inbound call detail reports on N = unpriced VNET inbound call detail reports off
vnetRpts	outboundCDR	Y = unpriced VNET outbound call detail reports on N = unpriced VNET outbound call detail

Data Response from StarOE - Overall Security

		reports off
vnetRpts	unpricedRpt	Y = unpriced VNET standard reports on N = unpriced VNET standard reports off
vnetRpts	unpricedException	Y = unpriced VNET exception reports on N = unpriced VNET exception reports off
vnetRpts	unpricedCDR	Y = unpriced VNET inbound call detail reports on N = unpriced VNET inbound call detail reports off
vnetRpts	outboundCDR	Y = unpriced VNET outbound call detail reports on N = unpriced VNET outbound call detail reports off

Interface Message with StarOE - Paging and Email

OEMessagingInfoRqst	doIt	Retrieves StarOE paging and email data from the StarOE server	OEMessagingInfoRsp
OEMessagingInfoRsp	GetMessaging InfoObj	Returns an object that contains the default paging and email strings.	OEMessagingInfo

Data Response from StarOE – Paging and Email

OEMessagingInfo	pagingSystem	Default paging system. 0, a-q For example, "b" stands for 1-800-PAGE-MCI (alpha-numeric)	"b"
OEMessagingInfo	pin	Default paging pin number	"7777777"
OEMessagingInfo	pagingMessage	Default paging message	"Bob, please call me"

Data Response from StarOE – Paging and Email

OEMessagingInfo	emailId	Default email address	"Bob.Smith@mci.com"
OEMessagingInfo	emailMsg	Default email text message	"The report is done."

Interface Message with StarOE – Geographic Hierarchy

OECountryInfoRqst	doIt	Retrieves StarOE countries	OECountryInfoRsp
OECountryInfoRsp	getCountryList	Returns a list of country objects. These country objects need to be further broken down to retrieve the two parts of a country (ID and long name).	Vector of objects – Contains OECountryInfo objects that hold countries.
OECountryInfo	getField	Returns a Field object that contains either a list of country ID's or a list of country long names.	Field
Field	get	Returns a string that either is a country ID or a country long name	String – Contains a country id or a country long name. An example of a country id is 001. An example of a country long name is USA/WORLD ZONE1.
OEStateInfoRqst	doIt	Retrieves StarOE states	OEStateInfoRsp
OEStateInfoRsp	getStateList	Returns a list of states. The Report Requestor displays this list of states to a user in the geographic hierarchy.	Vector – Contains strings to display to the user. For example, this list could contain the following: CO, HI, RI.
OECityInfoRqst	doIt	Retrieves StarOE cities	OECityInfoRsp
OECityInfoRsp	getCityList	Returns a list of cities. The Report	Vector – Contains strings to display to the

Interface Message with StarOE – Geographic Hierarchy

		Requestor displays this list of cities to a user in the geographic hierarchy.	user. For example, this list could contain the following: ASPEN, DENVER.
OENpaRqst	doIt	Retrieves StarOE Npa's	OENpaRsp
OENpaRsp	getNpaList	Returns a list of NPA's. The Report Requestor displays this list of NPA's to a user in the geographic hierarchy.	Vector – Contains strings to display to the user. For example, this list could contain the following: 808, 719.
OENxxRqst	doIt	Retrieves StarOE Nxx's	OENxxRsp
OENxxRsp	getNxxList	Returns a list of Nxx's. The Report Requestor displays this list of Nxx's to a user in the geographic hierarchy.	Vector – Contains strings to display to the user. For example, this list could contain the following: 220, 221.

Interface Message with StarOE – Billing Hierarchy

OECordIdSecRqst	doIt	Retrieves StarOE Corp Id's	OERptSecRsp – An object that can be iterated through to retrieve OERptSecRec objects. Each OERptSecRec object contains one Corp Id's data.
OEServiceLocSecRqst	doIt	Retrieves StarOE Service Locations	OERptSecRsp – An object that can be iterated through to retrieve OERptSecRec objects. Each OERptSecRec object contains one Service Location's data.
OETollFreeSecRqst	doIt	Retrieves StarOE 8xx numbers	OERptSecRsp – An object that can be iterated through to retrieve OERptSecRec objects.

Interface Message with StarOE – Billing Hierarchy

			Each OERptSecRec object contains one 8xx number's data.
OEVnetNodeSecRqst	doIt	Retrieves StarOE Vnet nodes	OERptSecRsp – An object that can be iterated through to retrieve OERptSecRec objects. Each OERptSecRec object contains one VNET node's data.
OEServiceLocDetailRqst	doIt	Retrieves StarOE additional information for a service location, such as the associated Corp Id or Bill Payer Id.	OEServiceLocDetailRsp – An object that contains a OEServiceLocDetail object. A OEServiceLocDetail object contains one VNET service location's details.

Data Response from StarOE - Billing Hierarchy

OERptSecRec	data	Corp ID	String – A corp ID. An example is 00008800.
OERptSecRec	data	Service Location	String – A service location. An example is N0000000.
OERptSecRec	data	8xx Number	String – An 8xx number. An example is 8885350000.
OERptSecRec	data	VNET Node	String – A VNET Node. An example is 22222.
OEServiceLocDetailRsp	corpId	Service Location's Details	String – The associated Corp Id for a service location. An example is 00008800.
OEServiceLocDetailRsp	serviceLoc	Service Location's Details	String – A service location. An example is N0000000.
OEServiceLocDetailRsp	serviceName	Service Location's Details	String – A service location name. An

Data Response from StarOE - Billing Hierarchy

			example is VNET Demo.
OEServiceLocDetailRsp	billPayerId	Service Location's Details	String – The associated bill payer for a service location. An example is 00008800.

APPENDIX I

Stored Procedure	Parameters	Action	Return
Wrs_val_rpt_usr	entp_id decimal (8,0) user_id char (20) product char (1) data_type char(1) rpt char (1)	Validates user can request that report type.	Yes or No and optionally if valid, if they no longer will be valid, an exclusion date.
Wrs_val_rpt_crp	entp_id decimal (8,0) user_id char (20) product char (1) data_type char(1) corp_id char (8)	Validates user's corp id.	Yes or No and optionally if valid, if they no longer will be valid, an exclusion date
Wrs_val_rpt_svc	entp_id decimal (8,0) user_id char (20) product char (1) data_type char(1) corp_id char (8) svc_loc char(8)	Validates user's service location.	Yes or No and optionally if valid, if they no longer will be valid, an exclusion date
Wrs_val_rpt_tfn	entp_id decimal (8,0) user_id char (20) product char (1) data_type char(1) corp_id char (8) tf_nbr	Validates user's toll free numbers. Corp_id is not required and can be passed in as an Informix Null.	Yes or No and optionally if valid, if they no longer will be valid, an exclusion date

	char(10)		
Wrs_val_rpt_nod	entp_id decimal (8,0) user_id char (20) product char (1) data_type char(1) rpt char (1) node_id decimal(8,0)	Validates user's node.	Yes or No and optionally if valid, if they no longer will be valid, an exclusion date
WRS_GET_NODE_DET	entp_id decimal (8,0) user_id char (20) product char (1) data_type char(1) rpt char (1) node_id decimal(8,0) "Y" (return all service locs).	Returns all Service Locations for that node	

WHAT IS CLAIMED IS:

1. A Web/Internet based reporting system for communicating customer-specific data retrieved from an enterprise fulfilling server to a client workstation via an integrated interface, said system comprising:

client browser application located at said client workstation for enabling interactive Web based communications with said reporting system, said client workstation identified with a customer and providing said integrated interface;

at least one secure server for managing client sessions over the Internet, said secure server supporting a secure socket connection enabling encrypted communication between said client browser application and said secure server;

report requestor object presenting one or more selectable reporting options for said customer in accordance with pre-determined customer entitlements, said requestor object generating a report request message in response to user selection of a specific reporting option for communication to a secure server over said secure socket connection;

report manager server for maintaining an inventory of reports associated with a customer and receiving said report request message, said report manager server accessing report items in response to a request message and generating a response message including a metadata description of reporting items for a requested report, said response message and associated customer-specific data being communicated to

a storage device associated with said client workstation over said communications link;

wherein said retrieved data and said metadata description of reporting items are utilized to generate a completed report for presentation to said customer via said interface.

2. The reporting system as claimed in Claim 1, further including a scheduler server for initiating retrieval of data associated with a particular report from said enterprise fulfilling server.

3. The reporting system as claimed in Claim 2, wherein said report requestor object includes a requestor applet downloaded from said web server to said client workstation, said applet capable of presenting said reporting options for said user on said client workstation in accordance with a report metadata message input.

4. The reporting system as claimed in Claim 2, wherein said scheduler server enables said customer to schedule execution of a report by said fulfilling server at a user-specified frequency.

5. The reporting system as claimed in Claim 4, wherein said reporting options includes report creation and report customization, said report manager server providing a list of reporting templates for a particular report product when creating a report, said report manager server further providing formatted

metadata responses including said list and associated customization criteria in accordance with customer entitlements to enable customization of a created report.

6. The reporting system as claimed in Claim 5, wherein said report requestor object further generates a report request message enabling said report manager server to provide a list of existing reports associated with said customer in accordance with a reporting product, said report manager providing formatted metadata responses including said list to enable said report customization.

7. The reporting system as claimed in Claim 6, wherein a modification includes enabling re-scheduling of an existing report.

8. The reporting system as claimed in Claim 4, wherein said scheduler server communicates with said report manager server to save a metadata description of a modified or customized report.

9. The reporting system as claimed in Claim 4, wherein said reporting option includes running an existing report, said report scheduler submitting a message to a said fulfilling server to run it at a pre-determined time.

10. The reporting system as claimed in Claim 1, further including device for supporting one or more

socket communications transport options, said device providing an indication of a type of communications transport in said request message, said response data being communicated back to said report requestor object in accordance with said communication transport option.

11. The reporting system as claimed in Claim 1, wherein said transport mechanism is one selected from asynchronous, synchronous and bulk transfer communication transport mechanisms.

12. The reporting system as claimed in Claim 1, further including administrative server including a representation of reporting entitlements associated with said customer, said browser application communicating with said administrative server for obtaining said list of reports to which said user is entitled.

13. The reporting system as claimed in Claim 12, wherein said fulfilling server pushes report data to a memory storage device and notifies said report manager server as to the location of said report data.

14. The reporting system as claimed in Claim 13, further including a report viewing device for accessing said retrieved data of a requested report from said memory storage location in accordance with a metadata description of said report.

15. The reporting system as claimed in Claim 1, further including parsing object for parsing metadata request messages received from said report requestor object to access items from said message directing said report manager to retrieve requested reports and report items from said report inventory.

16. The reporting system as claimed in Claim 1, wherein said enterprise is a telecommunications service provider, said fulfilling server of said enterprise for generating priced call detail data pertaining to a customer's telecommunications network usage.

17. The reporting system as claimed in Claim 1, said fulfilling server generating un-priced call detail and statistical data pertaining to a customer's telecommunications network usage.

18. The reporting system as claimed in Claim 14, wherein said metadata message places said report data in a form enabling said report viewing device to present said data in a spread sheet format.

19. The reporting system as claimed in Claim 18, wherein said report viewing device enables roll-up of report data.

20. The reporting system as claimed in Claim 18, wherein said report viewing device enables drill-down of report data.

21. A method for generating reports comprising customer-specific data for presentation via a Web/Internet-based integrated interface, said integrated interface including a client browser application located at a client workstation for enabling interactive Web based communications between said customer and said integrated interface, said method comprising:

managing a client session over the Web/Internet by providing a first server device capable of supporting a secure socket connection enabling encrypted communication between said client browser application and said first server;

providing a second server device for communicating with said first server device through a firewall over a second socket connection, said first secure socket and second socket connection forming a secure communications link for enabling forwarding of report request messages and associated report response messages;

presenting at said client workstation a report request menu including various user-selectable reporting options for said customer in accordance with customer entitlements;

generating a said report request message having said user-selected reporting options, said request message being communicated over said secure communications link;

maintaining an inventory of reports associated with a customer and accessing report items

in accordance with said report request message;

generating a response message including a metadata description of said report items selected by a user;

communicating said response message and said customer-specific data to a storage device associated with said client workstation over said communications link; and,

generating a report at said client workstation from said communicated data and said metadata description of said report.

22. The method as claimed in Claim 21, further including scheduling retrieval of customer specific data associated with a particular report from an enterprise fulfilling server.

23. The method as claimed in Claim 21, wherein said step of generating a report request message includes downloading an applet from said first server device to said client workstation, said applet being executed to present said reporting options for said user at said client workstation.

24. The method as claimed in Claim 22, further including the step of scheduling execution of a report by said fulfilling server at a user-specified frequency.

25. The method as claimed in Claim 22, wherein said reporting options include report creation

and report customization, said step of generating a said report request message including generating a formatted message request for a report manager to provide a list of reporting templates for a particular report product, said report manager providing formatted metadata responses including said list of templates and associated customization criteria in accordance with customer entitlements to enable customization of a created report.

26. The method as claimed in Claim 25, wherein said customization includes providing messaging to enabling re-scheduling of an existing report.

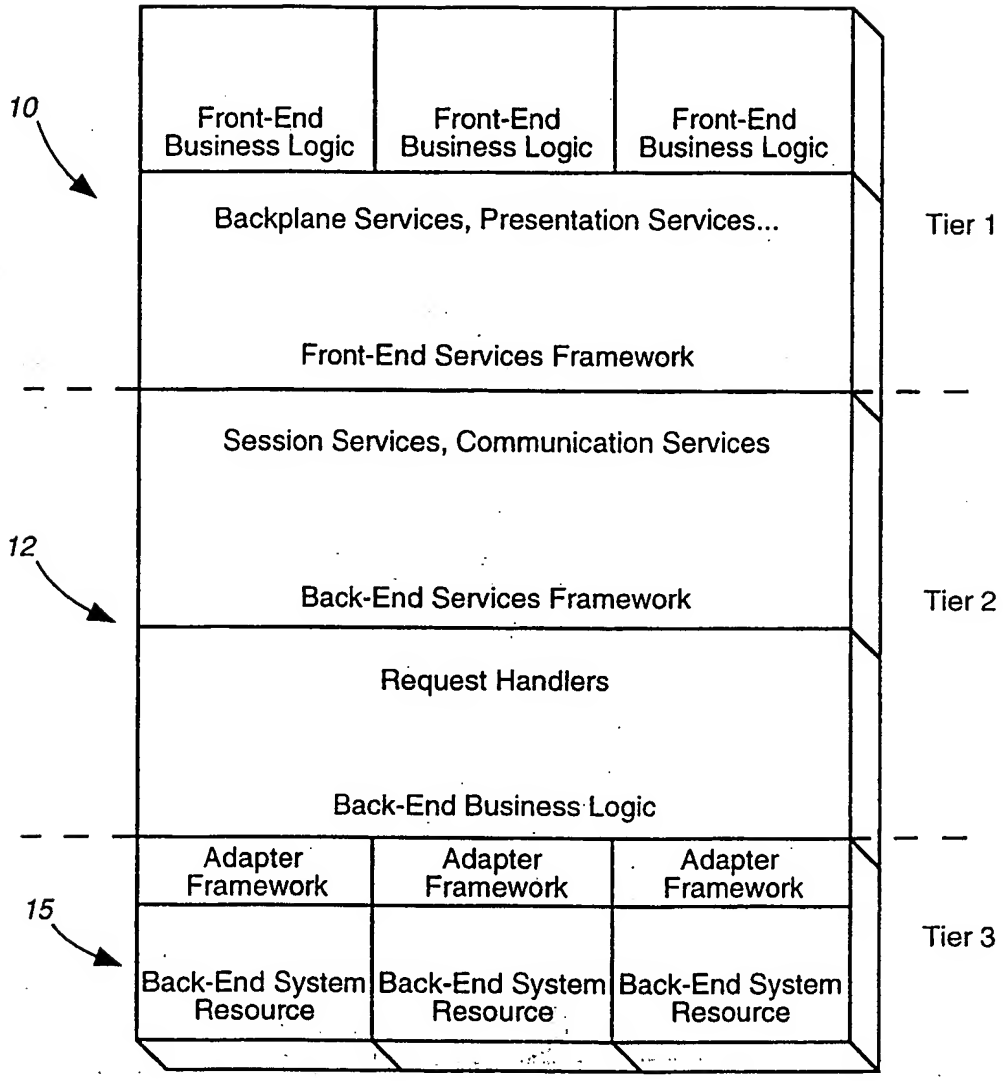

10
Front-End Business Logic
Front-End Business Logic
Front-End Business Logic
Backplane Services, Presentation Services...
Tier 1
Front-End Services Framework
Session Services, Communication Services
12
Back-End Services Framework
Tier 2
Request Handlers
Back-End Business Logic
Adapter Framework
Adapter Framework
Adapter Framework
15
Back-End System Resource
Back-End System Resource
Back-End System Resource
Tier 3

FIG. 1

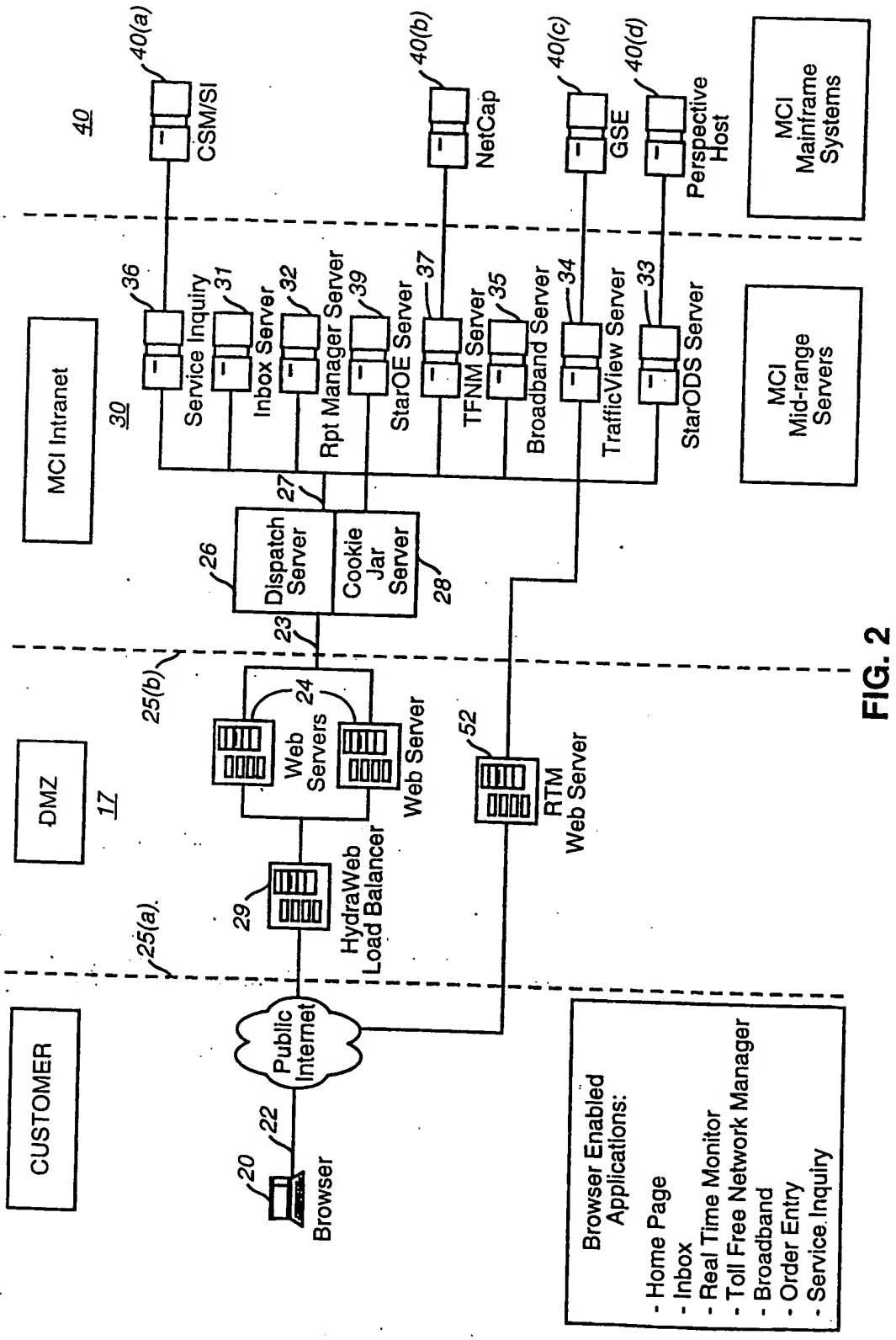

CUSTOMER
Browser
20
22
Public Internet
25(a)
HydraWeb Load Balancer
29
DMZ
17
25(b)
Web Servers
24
Web Server
RTM Web Server
52
Dispatch Server
26
Cookie Jar Server
28
27
23
MCI Intranet
30
Service Inquiry
36
Inbox Server
31
Rpt Manager Server
32
StarOE Server
39
TFNM Server
37
Broadband Server
35
TrafficView Server
34
StarODS Server
33
40
CSM/SI
40(a)
NetCap
40(b)
GSE
40(c)
Perspective Host
40(d)
MCI Mainframe Systems
MCI Mid-range Servers
Browser Enabled Applications:
- Home Page
- Inbox
- Real Time Monitor
- Toll Free Network Manager
- Broadband
- Order Entry
- Service Inquiry

FIG. 2

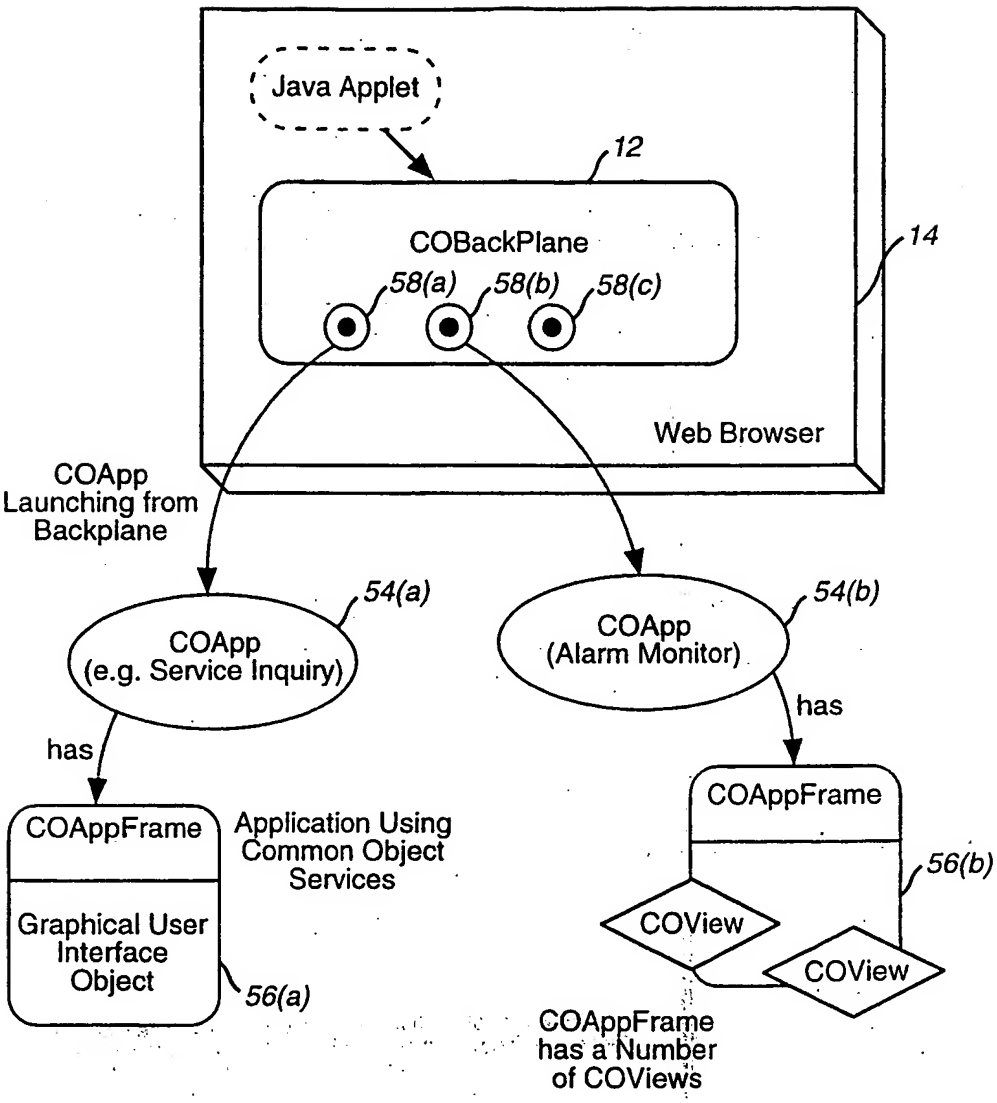

Java Applet
12
COBackPlane
58(a)
58(b)
58(c)
14
Web Browser
COApp
Launching from
Backplane
54(a)
COApp
(e.g. Service Inquiry)
54(b)
COApp
(Alarm Monitor)
has
has
COAppFrame
Application Using
Common Object
Services
Graphical User
Interface
Object
56(a)
COAppFrame
56(b)
COView
COView
COAppFrame
has a Number
of COViews

FIG. 3

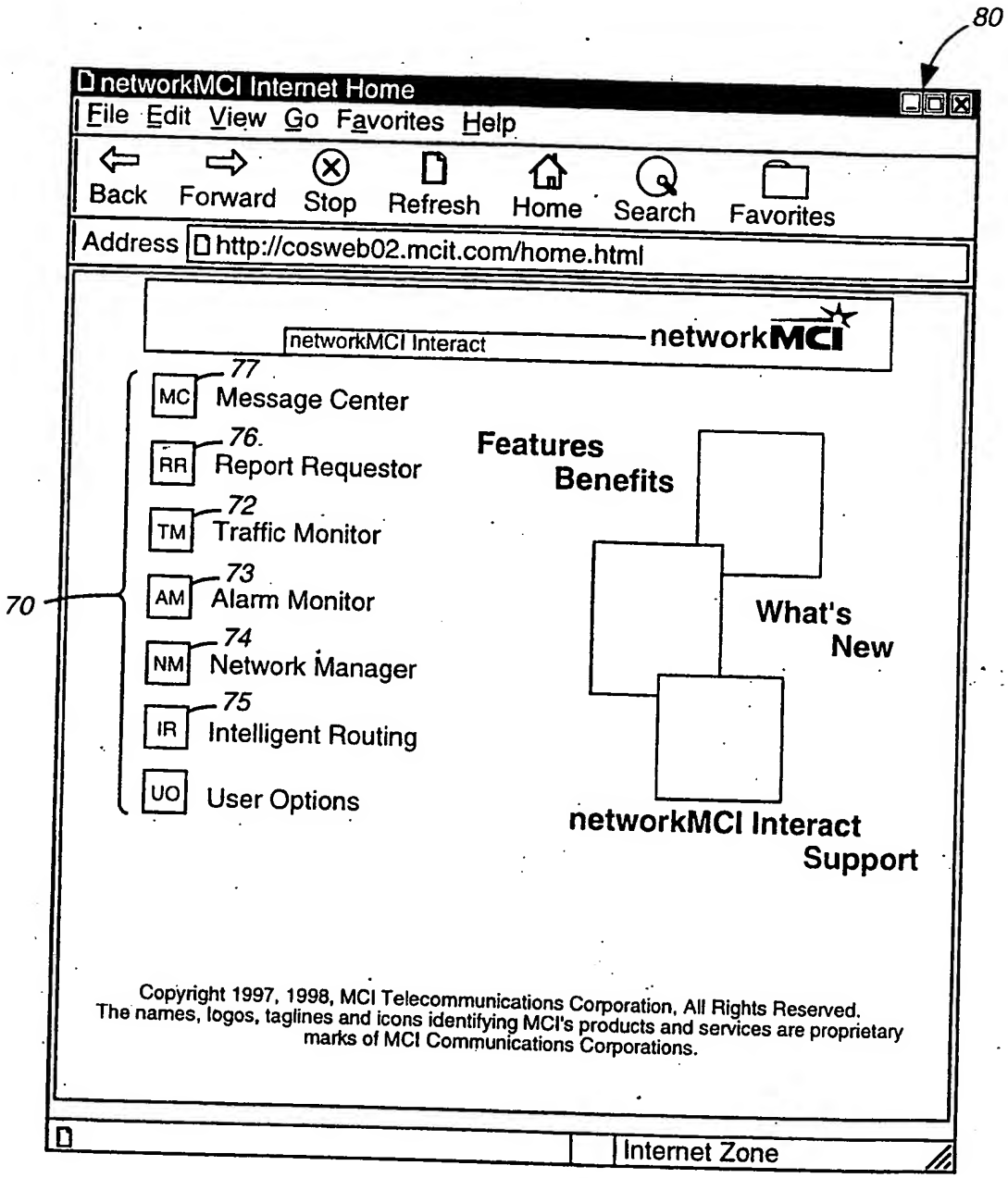

80
networkMCI Internet Home
File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorites
Address http://cosweb02.mcit.com/home.html
networkMCI Interact
networkMCI
70
MC 77 Message Center
RR 76 Report Requestor
TM 72 Traffic Monitor
AM 73 Alarm Monitor
NM 74 Network Manager
IR 75 Intelligent Routing
UO User Options
Features
Benefits
What's New
networkMCI Interact Support
Copyright 1997, 1998, MCI Telecommunications Corporation, All Rights Reserved.
The names, logos, taglines and icons identifying MCI's products and services are proprietary marks of MCI Communications Corporations.
Internet Zone

FIG. 4

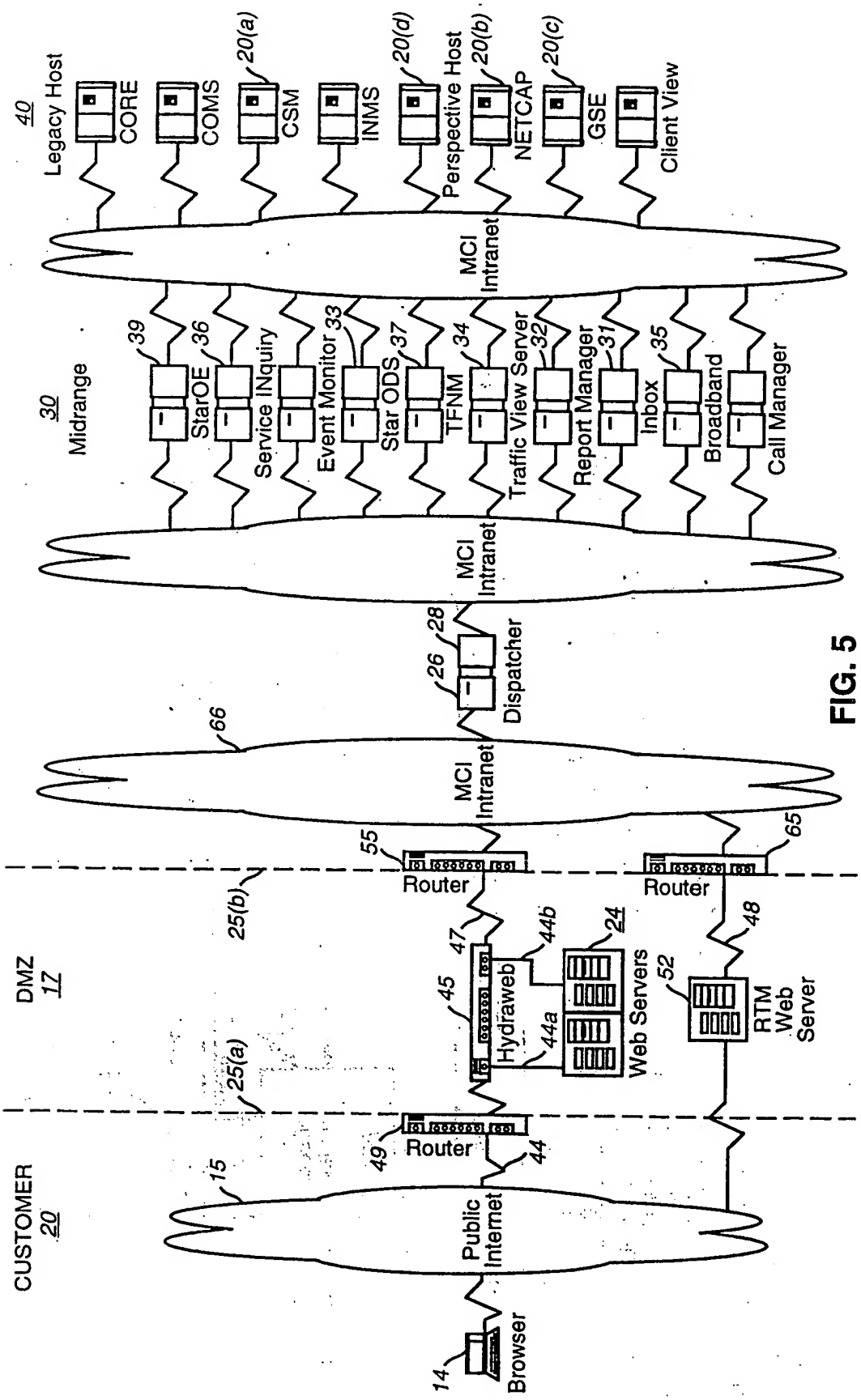

40
Legacy Host
CORE
COMS
20(a)
CSM
INMS
20(d)
Perspective Host
20(b)
NETCAP
20(c)
GSE
Client View
MCI Intranet
30
Midrange
39
StarOE
36
Service INquiry
Event Monitor
33
Star ODS
37
TFNM
34
Traffic View Server
32
Report Manager
31
Inbox
35
Broadband
Call Manager
MCI Intranet
28
26
Dispatcher
66
MCI Intranet
55
Router
65
Router
25(b)
DMZ
17
47
45
Hydraweb
44b
44a
24
Web Servers
48
52
RTM Web Server
25(a)
49
Router
44
CUSTOMER
20
15
Public Internet
14
Browser

FIG. 5

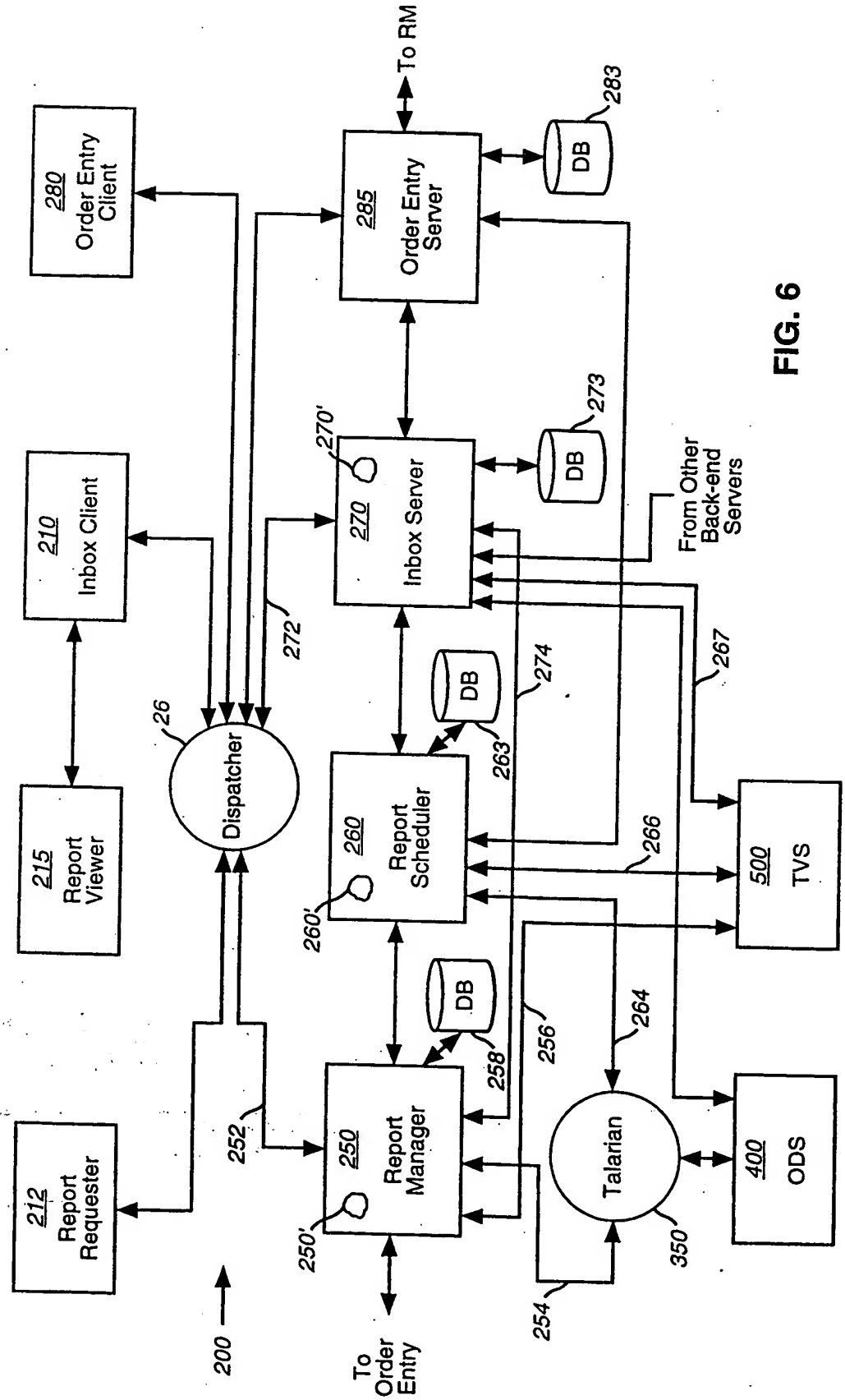

To RM
280 Order Entry Client
285 Order Entry Server
283
DB
210 Inbox Client
270' 270 Inbox Server
273
DB
From Other Back-end Servers
272
267
274
26
Dispatcher
DB
263
215 Report Viewer
260 Report Scheduler
260'
266
500 TVS
DB
258
256
264
212 Report Requester
252
250 Report Manager
250'
Talarian
350
400 ODS
254
200
To Order Entry

FIG. 6

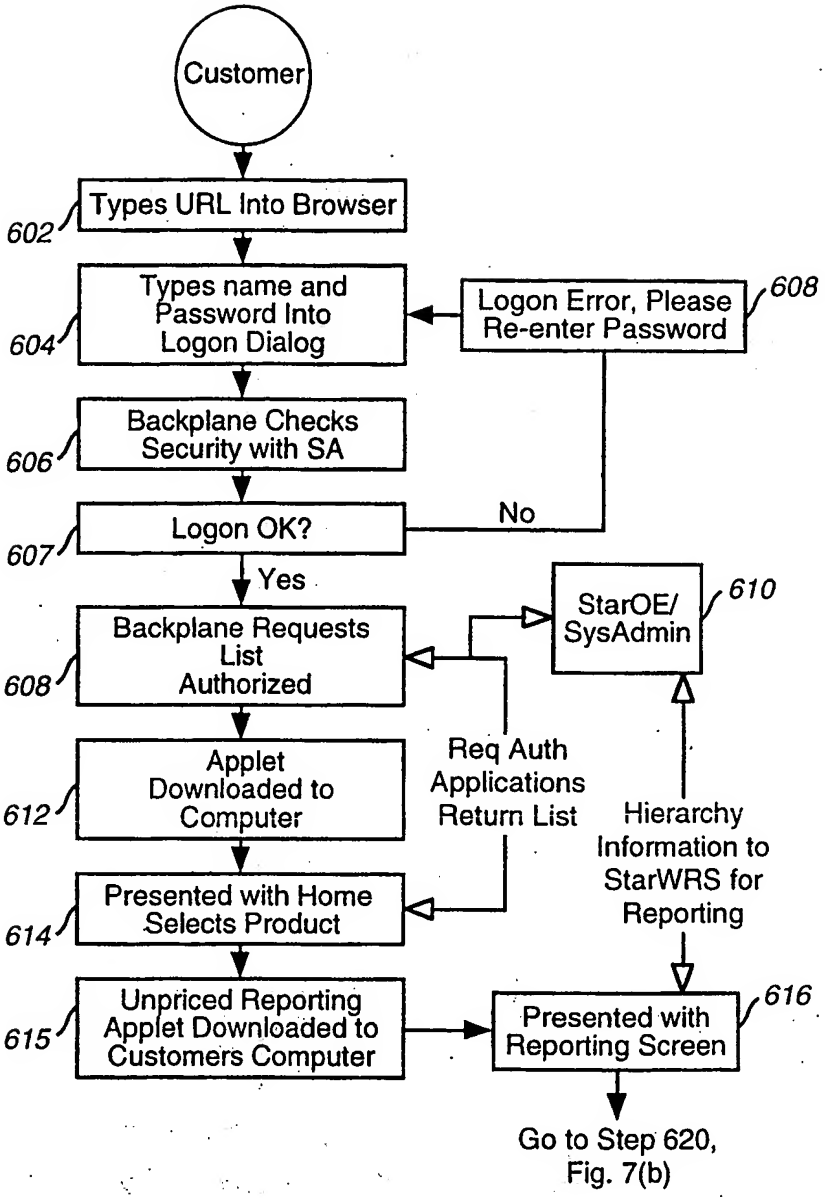

Customer
Types URL Into Browser
602
Types name and Password Into Logon Dialog
604
Logon Error, Please Re-enter Password
608
Backplane Checks Security with SA
606
Logon OK?
607
No
Yes
StarOE/ SysAdmin
610
Backplane Requests List Authorized
608
Req Auth Applications Return List
Hierarchy Information to StarWRS for Reporting
Applet Downloaded to Computer
612
Presented with Home Selects Product
614
Unpriced Reporting Applet Downloaded to Customers Computer
615
Presented with Reporting Screen
616
Go to Step 620, Fig. 7(b)

FIG. 7(a)

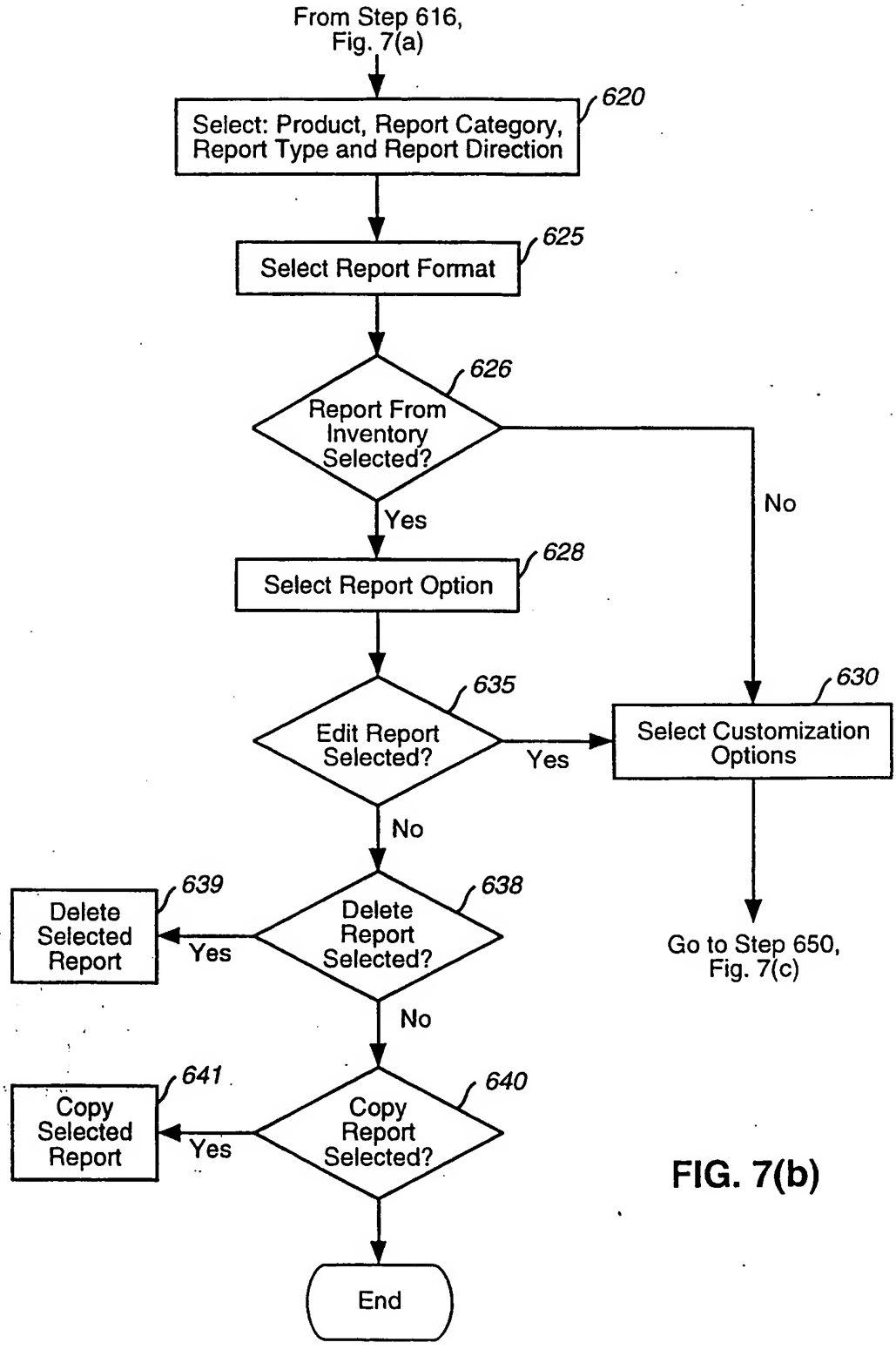

From Step 616, Fig. 7(a)
620
Select: Product, Report Category, Report Type and Report Direction
625
Select Report Format
626
Report From Inventory Selected?
Yes
No
628
Select Report Option
635
Edit Report Selected?
Yes
630
Select Customization Options
No
639
Delete Selected Report
Yes
638
Delete Report Selected?
Go to Step 650, Fig. 7(c)
No
641
Copy Selected Report
Yes
640
Copy Report Selected?
End

FIG. 7(b)

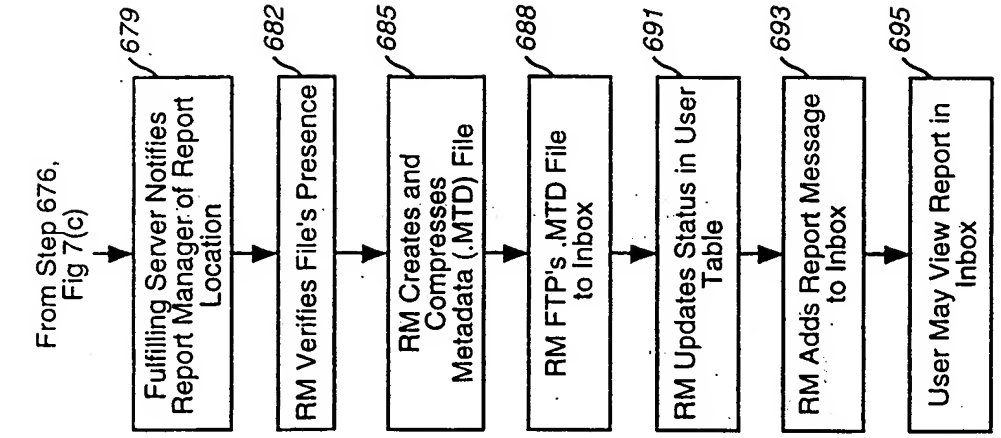

From Step 676, Fig 7(c)
679
Fulfilling Server Notifies Report Manager of Report Location
682
RM Verifies File's Presence
685
RM Creates and Compresses Metadata (.MTD) File
688
RM FTP's .MTD File to Inbox
691
RM Updates Status in User Table
693
RM Adds Report Message to Inbox
695
User May View Report in Inbox

FIG. 7(d)

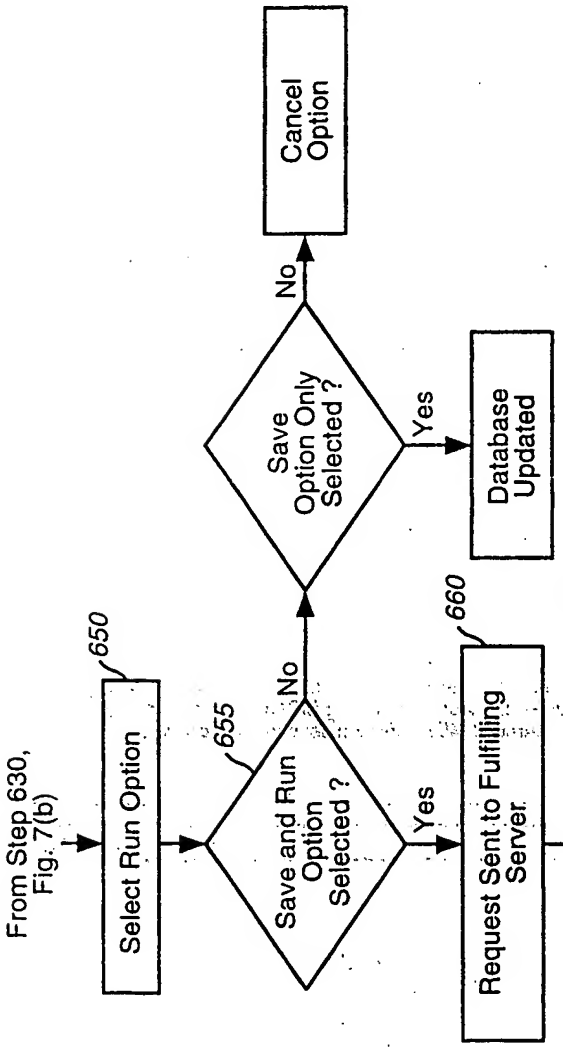
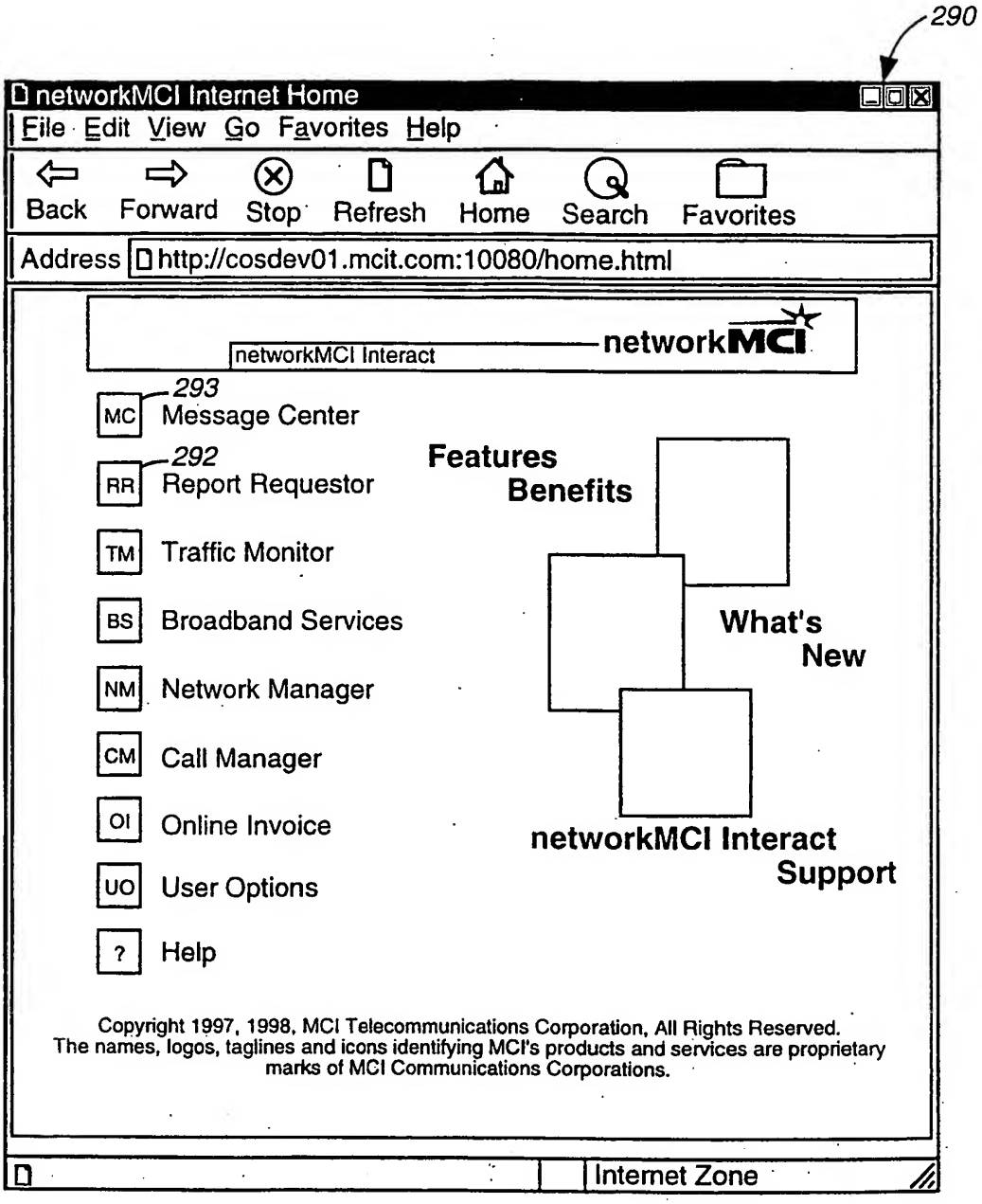

From Step 630, Fig. 7(b)
650
Select Run Option
655
Save and Run Option Selected ?
No
Yes
Save Option Only Selected ?
No
Yes
Cancel Option
Database Updated
660
Request Sent to Fulfilling Server
665
Fulfilling Server Runs Report
670
File is Compressed
673
Report Sent to Inbox via FTP
676
Fulfilling Server Verifies FTP
Go to Step 679, Fig. 7(d)

FIG. 7(c)


290
networkMCI Internet Home
File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorites
Address http://cosdev01.mcit.com:10080/home.html
networkMCI Interact
networkMCI
293
MC Message Center
292
RR Report Requestor
TM Traffic Monitor
BS Broadband Services
NM Network Manager
CM Call Manager
OI Online Invoice
UO User Options
? Help
Features
Benefits
What's New
networkMCI Interact Support
Copyright 1997, 1998, MCI Telecommunications Corporation, All Rights Reserved.
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Internet Zone

FIG. 8

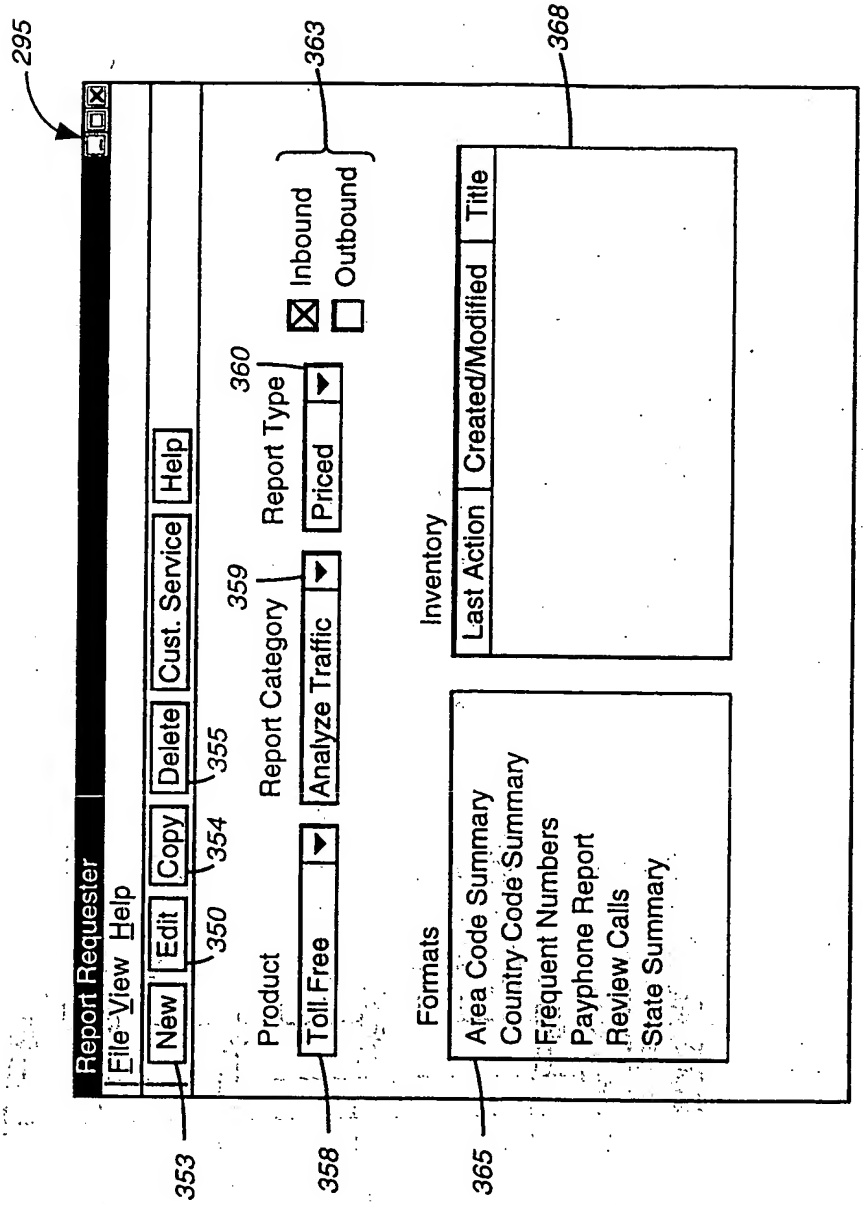
295
Report Requester
File View Help
New
Edit
Copy
Delete
Cust. Service
Help
350
354
355
353
Product
Toll Free
358
Report Category
359
Analyze Traffic
Report Type
360
Priced
Inbound
Outbound
363
Inventory
Last Action
Created/Modified
Title
368
Formats
Area Code Summary
Country Code Summary
Frequent Numbers
Payphone Report
Review Calls
State Summary
365

FIG. 9(a)

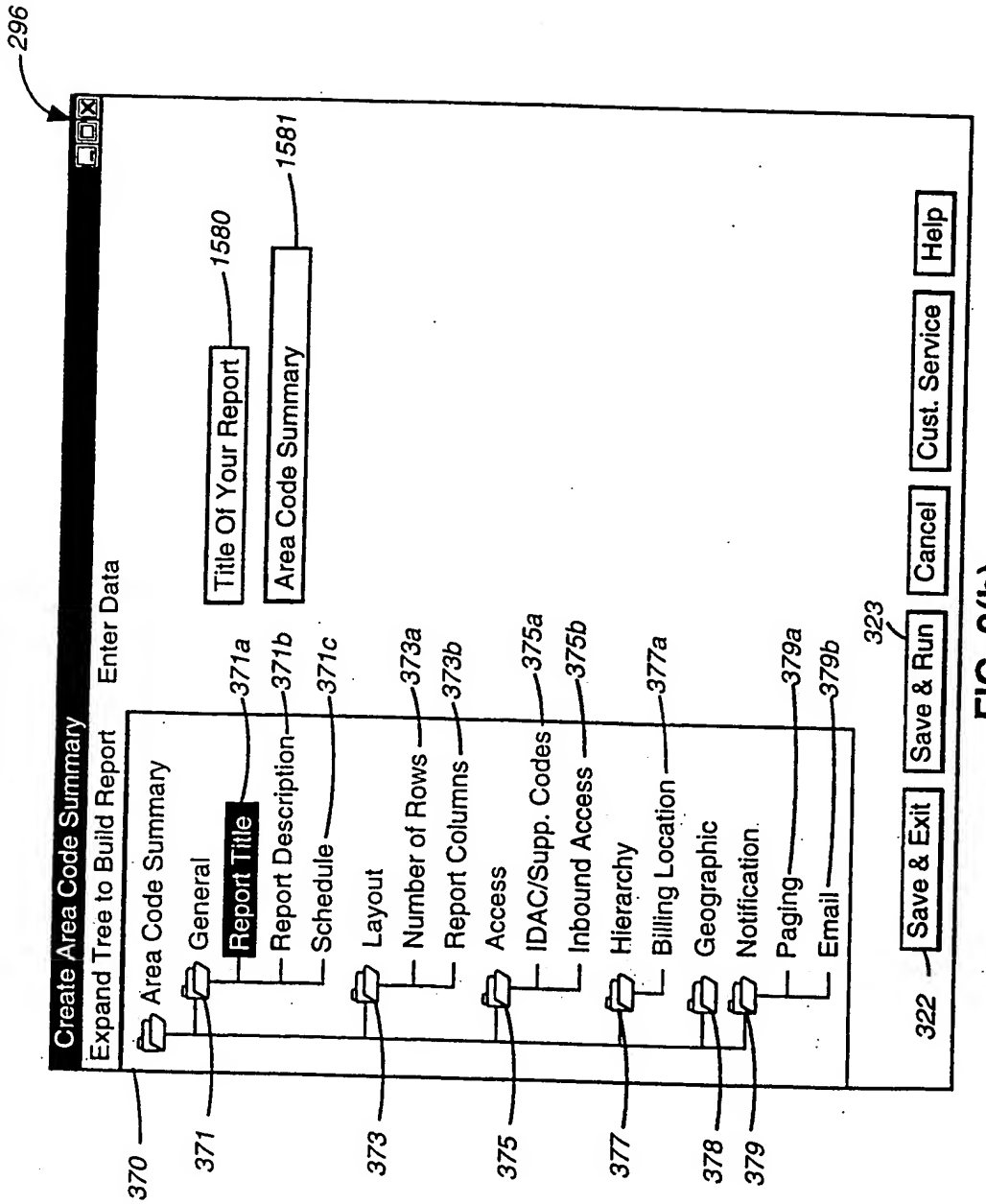
296
Create Area Code Summary
Expand Tree to Build Report
Enter Data
Area Code Summary
General
Report Title
Report Description
Schedule
Layout
Number of Rows
Report Columns
Access
IDAC/Supp. Codes
Inbound Access
Hierarchy
Billing Location
Geographic
Notification
Paging
Email
Title Of Your Report
Area Code Summary
Save & Exit
Save & Run
Cancel
Cust. Service
Help
370
371
373
375
377
378
379
322
323
371a
371b
371c
373a
373b
375a
375b
377a
379a
379b
1580
1581

FIG. 9(b)

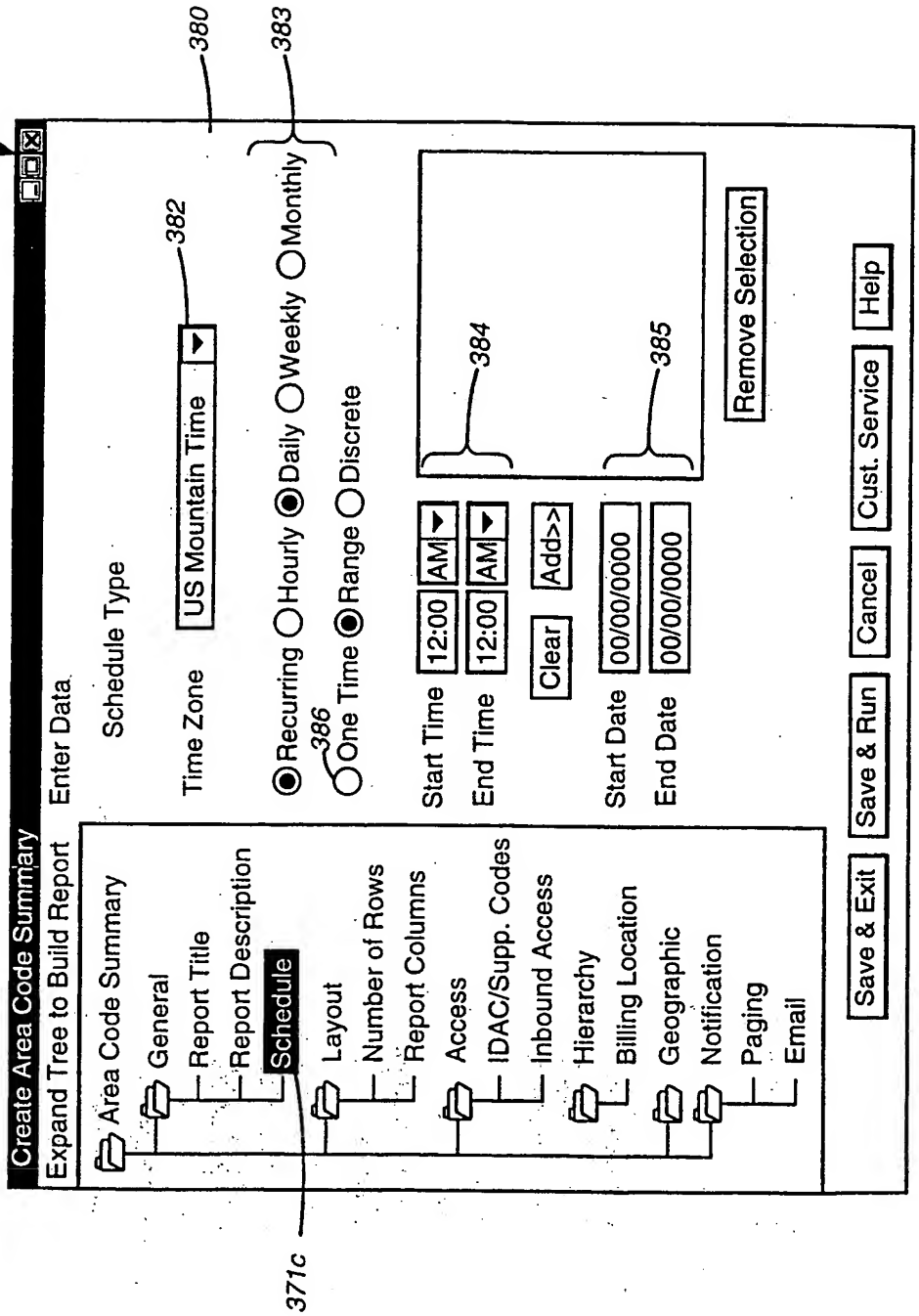
297
380
383
382
386
384
385
371c
Create Area Code Summary
Expand Tree to Build Report
Enter Data
Area Code Summary
General
Report Title
Report Description
Schedule
Layout
Number of Rows
Report Columns
Access
IDAC/Supp. Codes
Inbound Access
Hierarchy
Billing Location
Geographic
Notification
Paging
Email
Schedule Type
Time Zone
US Mountain Time
Recurring
Hourly
Daily
Weekly
Monthly
One Time
Range
Discrete
Start Time
End Time
12:00
AM
Clear
Add>>
Start Date
End Date
00/00/0000
Remove Selection
Save & Exit
Save & Run
Cancel
Cust. Service
Help

FIG. 9(c)

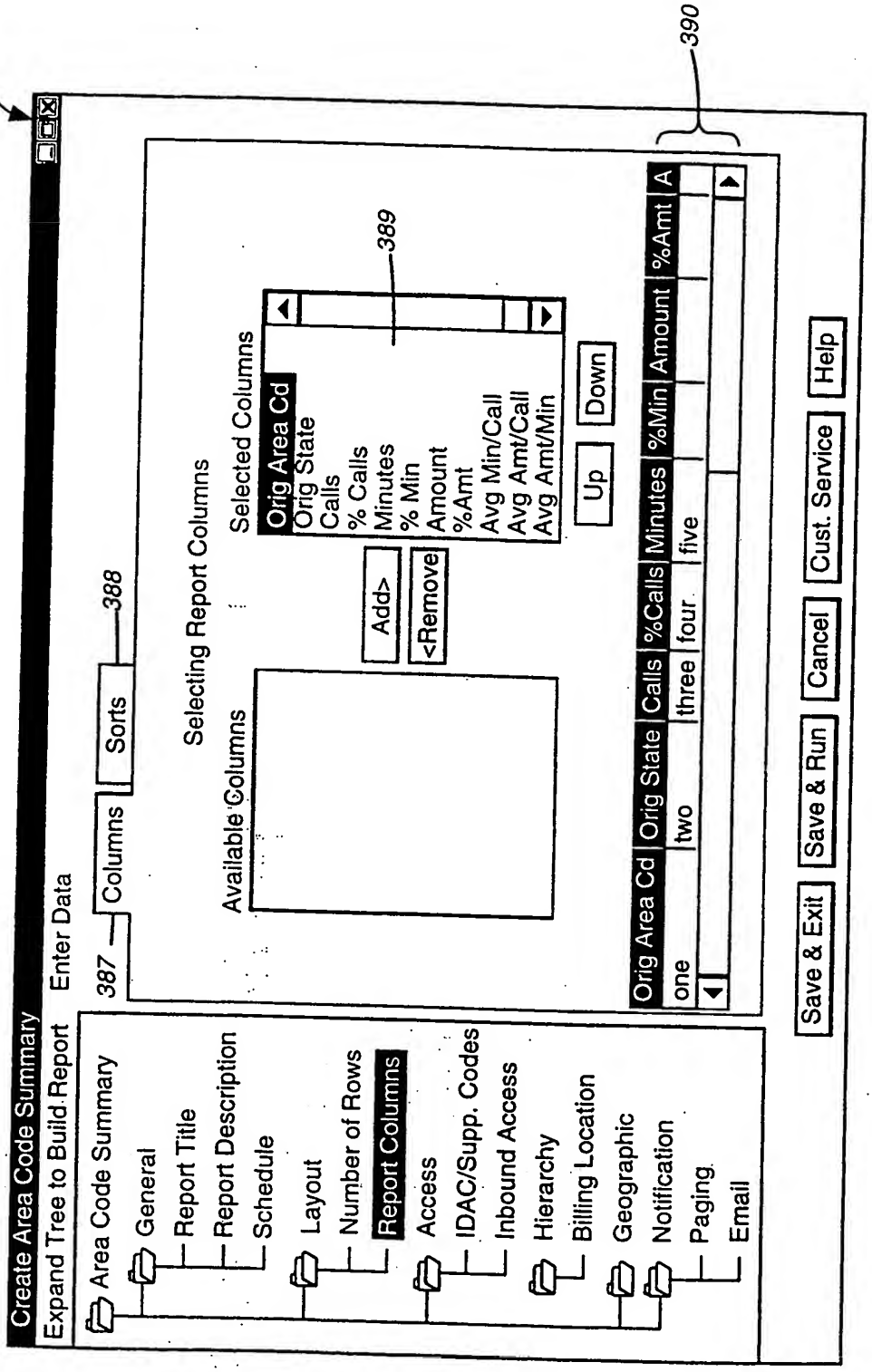
298
Create Area Code Summary
Expand Tree to Build Report
Enter Data
Area Code Summary
General
Report Title
Report Description
Schedule
Layout
Number of Rows
Report Columns
Access
IDAC/Supp. Codes
Inbound Access
Hierarchy
Billing Location
Geographic
Notification
Paging
Email
387
Columns
Sorts
388
Selecting Report Columns
Available Columns
Add>
<Remove
Selected Columns
Orig Area Cd
Orig State
Calls
% Calls
Minutes
% Min
Amount
%Amt
Avg Min/Call
Avg Amt/Call
Avg Amt/Min
389
Up
Down
390
Orig Area Cd | Orig State | Calls | %Calls | Minutes | %Min | Amount | %Amt | A
one | two | three | four | five
Save & Exit
Save & Run
Cancel
Cust. Service
Help

FIG. 9(d)

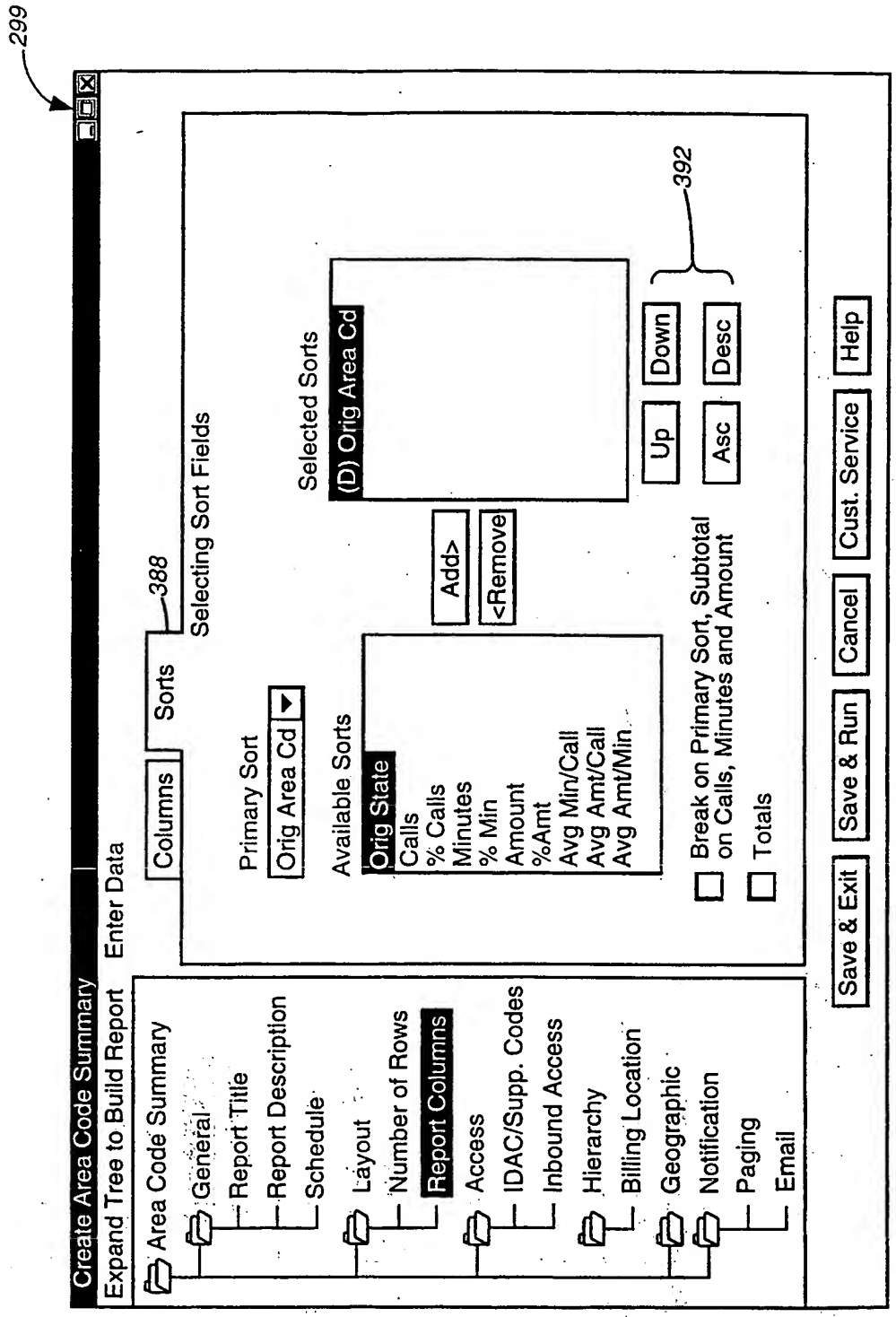
299
Create Area Code Summary
Expand Tree to Build Report
Enter Data
Area Code Summary
General
Report Title
Report Description
Schedule
Layout
Number of Rows
Report Columns
Access
IDAC/Supp. Codes
Inbound Access
Hierarchy
Billing Location
Geographic
Notification
Paging
Email
Columns
Sorts
388
Selecting Sort Fields
Primary Sort
Orig Area Cd
Available Sorts
Orig State
Calls
% Calls
Minutes
% Min
Amount
%Amt
Avg Min/Call
Avg Amt/Call
Avg Amt/Min
Add>
<Remove
Selected Sorts
(D) Orig Area Cd
392
Up
Down
Asc
Desc
Break on Primary Sort, Subtotal on Calls, Minutes and Amount
Totals
Save & Exit
Save & Run
Cancel
Cust. Service
Help

FIG. 9(e)

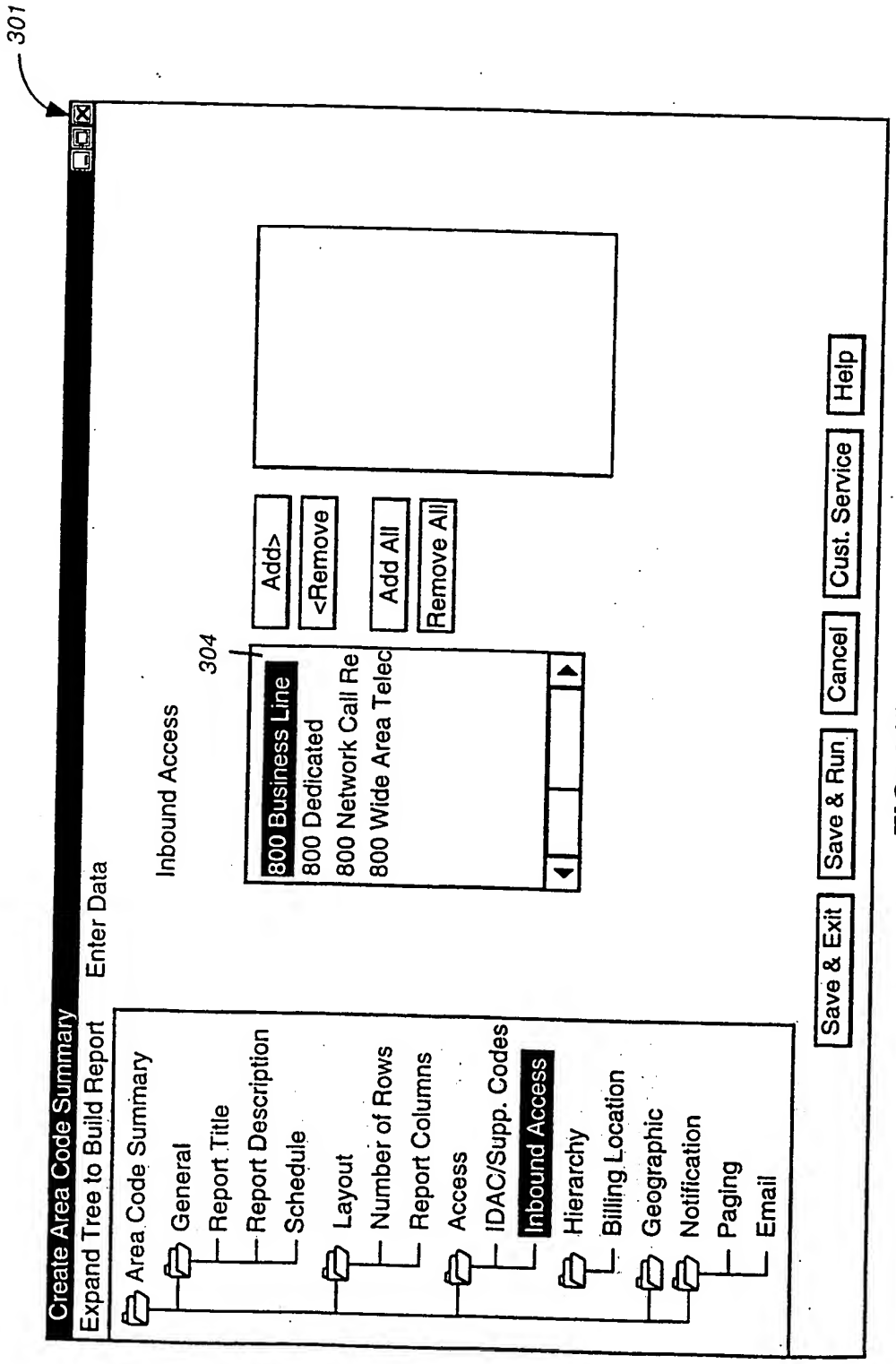
301
Create Area Code Summary
Expand Tree to Build Report
Enter Data
Area Code Summary
General
Report Title
Report Description
Schedule
Layout
Number of Rows
Report Columns
Access
IDAC/Supp. Codes
Inbound Access
Hierarchy
Billing Location
Geographic
Notification
Paging
Email
Inbound Access
304
800 Business Line
800 Dedicated
800 Network Call Re
800 Wide Area Telec
Add>
<Remove
Add All
Remove All
Save & Exit
Save & Run
Cancel
Cust. Service
Help

FIG. 9(f)

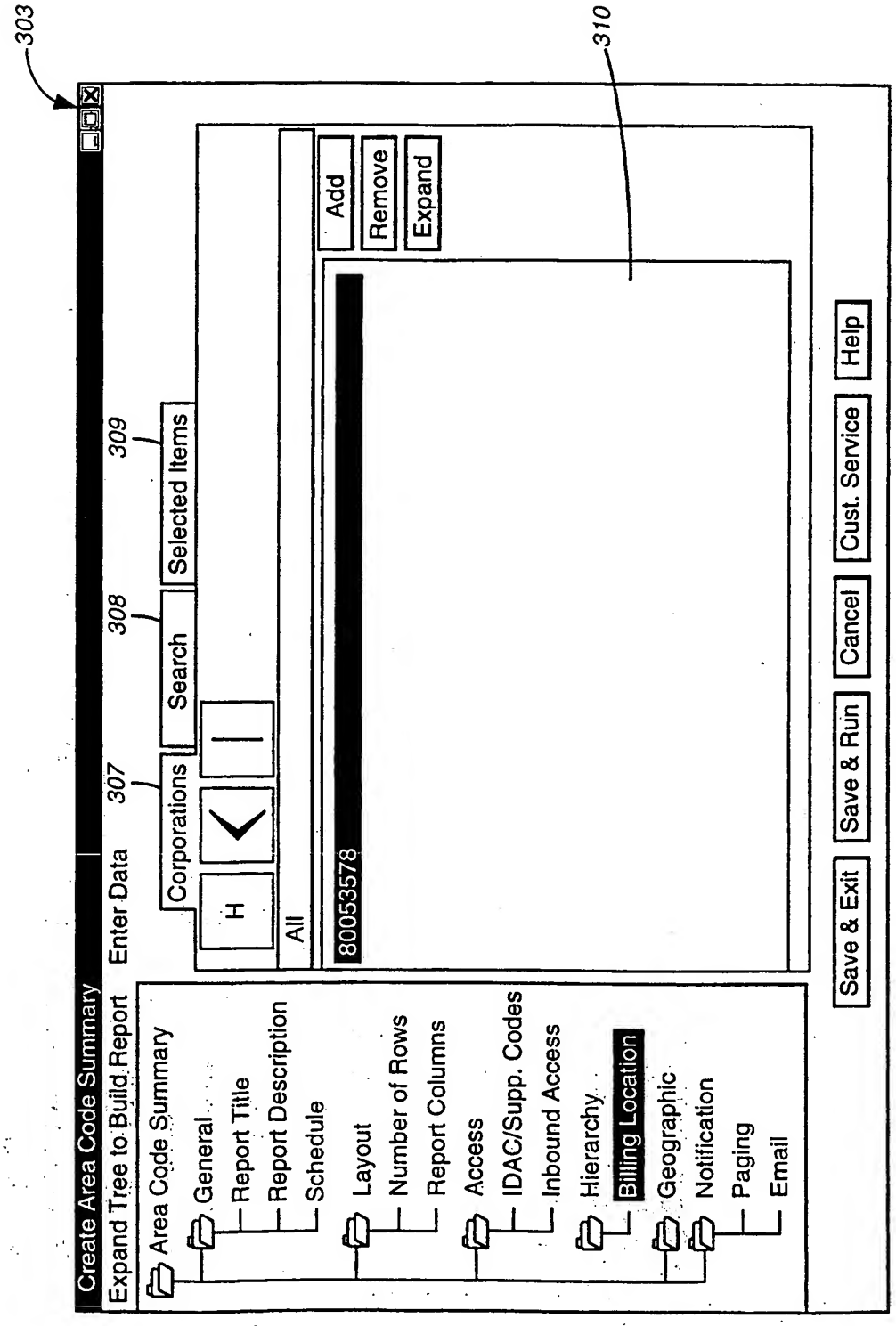
303
310
Create Area Code Summary
Expand Tree to Build Report
Enter Data
307
308
309
Corporations
Search
Selected Items
H
All
80053578
Add
Remove
Expand
Area Code Summary
General
Report Title
Report Description
Schedule
Layout
Number of Rows
Report Columns
Access
IDAC/Supp. Codes
Inbound Access
Hierarchy
Billing Location
Geographic
Notification
Paging
Email
Save & Exit
Save & Run
Cancel
Cust. Service
Help

FIG. 9(g)

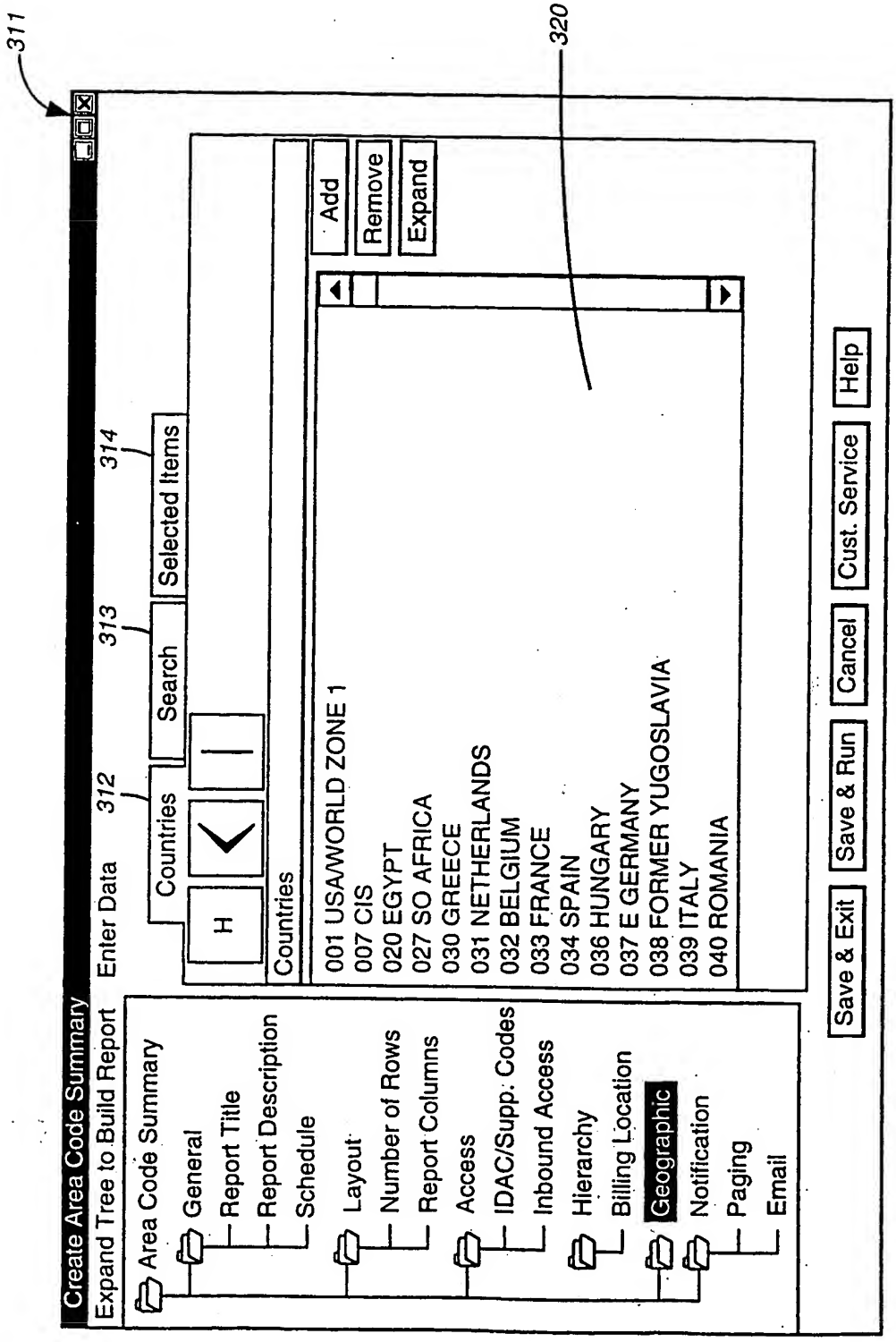
311
320
Create Area Code Summary
Expand Tree to Build Report
Enter Data
312
313
314
Countries
Search
Selected Items
H
Countries
001 USA/WORLD ZONE 1
007 CIS
020 EGYPT
027 SO AFRICA
030 GREECE
031 NETHERLANDS
032 BELGIUM
033 FRANCE
034 SPAIN
036 HUNGARY
037 E GERMANY
038 FORMER YUGOSLAVIA
039 ITALY
040 ROMANIA
Add
Remove
Expand
Area Code Summary
General
Report Title
Report Description
Schedule
Layout
Number of Rows
Report Columns
Access
IDAC/Supp. Codes
Inbound Access
Hierarchy
Billing Location
Geographic
Notification
Paging
Email
Save & Exit
Save & Run
Cancel
Cust. Service
Help

FIG. 9(h)

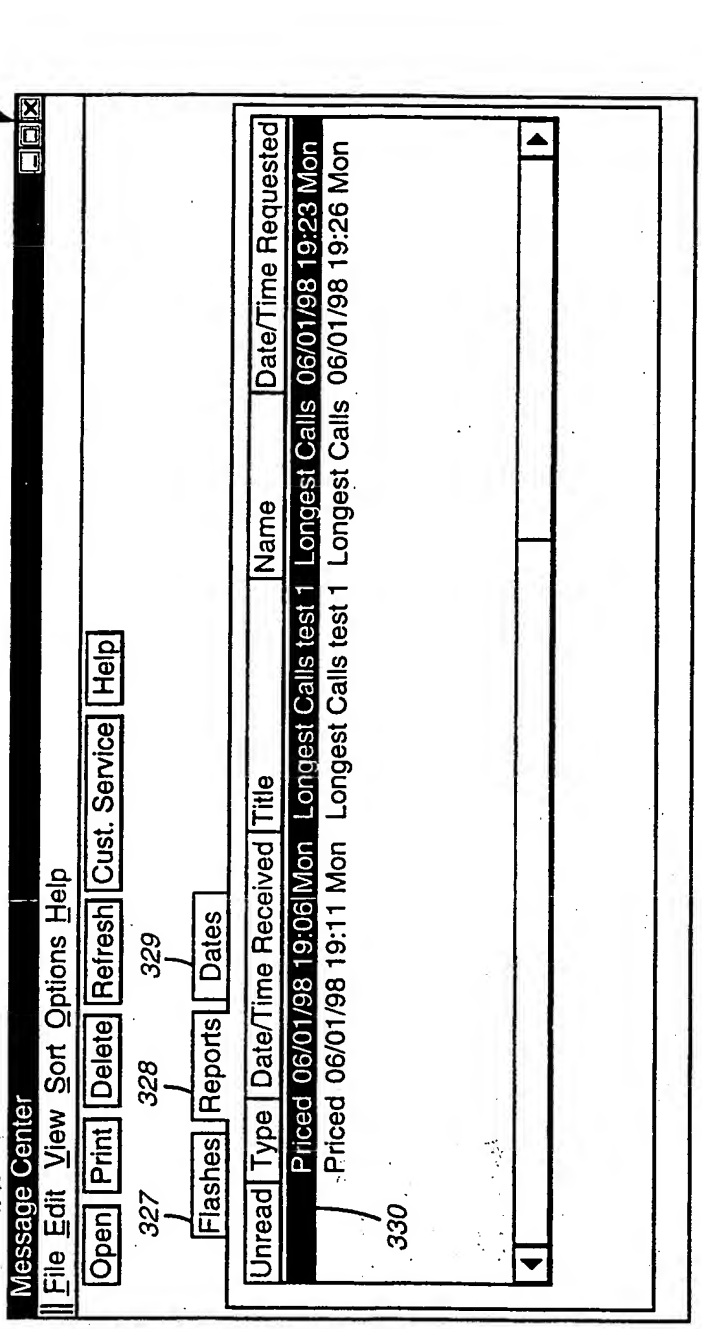
325
Message Center
File Edit View Sort Options Help
Open
Print
Delete
Refresh
Cust. Service
Help
327
328
329
Flashes
Reports
Dates
Unread
Type
Date/Time Received
Title
Name
Date/Time Requested
Priced 06/01/98 19:06 Mon Longest Calls test 1 Longest Calls 06/01/98 19:23 Mon
Priced 06/01/98 19:11 Mon Longest Calls test 1 Longest Calls 06/01/98 19:26 Mon
330

FIG. 10(a)

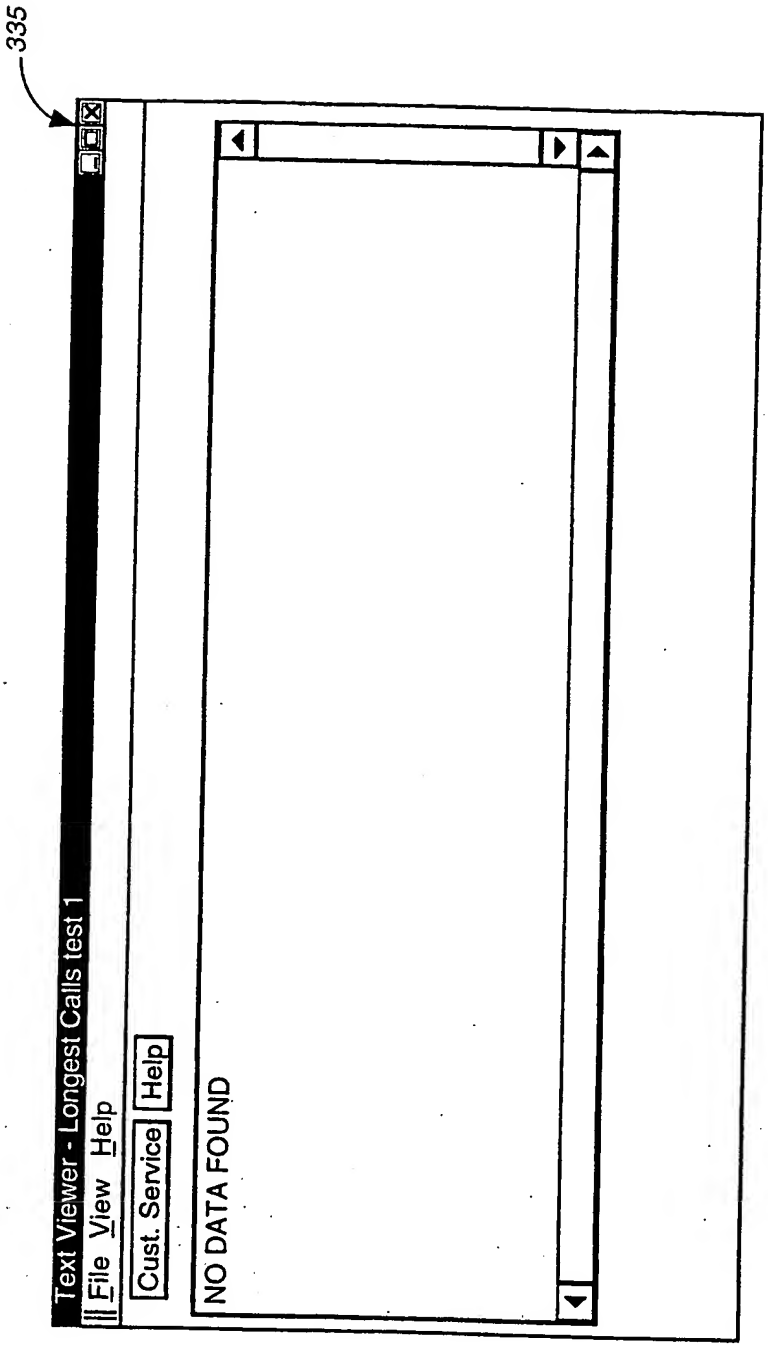
335
Text Viewer - Longest Calls test 1
File View Help
Cust. Service
Help
NO DATA FOUND

FIG. 10(b)

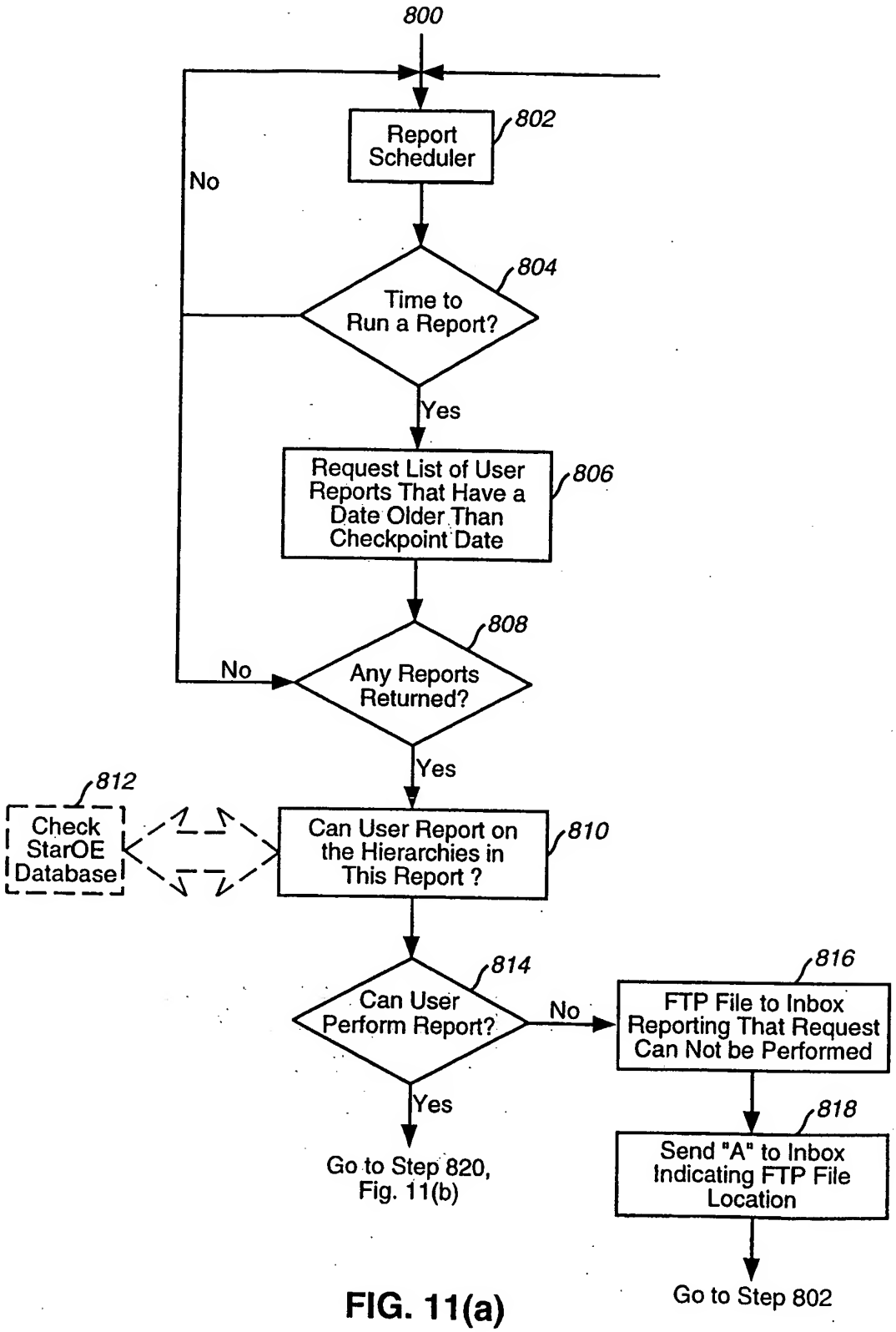
800
Report Scheduler
802
No
Time to Run a Report?
804
Yes
Request List of User Reports That Have a Date Older Than Checkpoint Date
806
No
Any Reports Returned?
808
Yes
Check StarOE Database
812
Can User Report on the Hierarchies in This Report ?
810
Can User Perform Report?
814
No
FTP File to Inbox Reporting That Request Can Not be Performed
816
Yes
Go to Step 820, Fig. 11(b)
Send "A" to Inbox Indicating FTP File Location
818
Go to Step 802

FIG. 11(a)

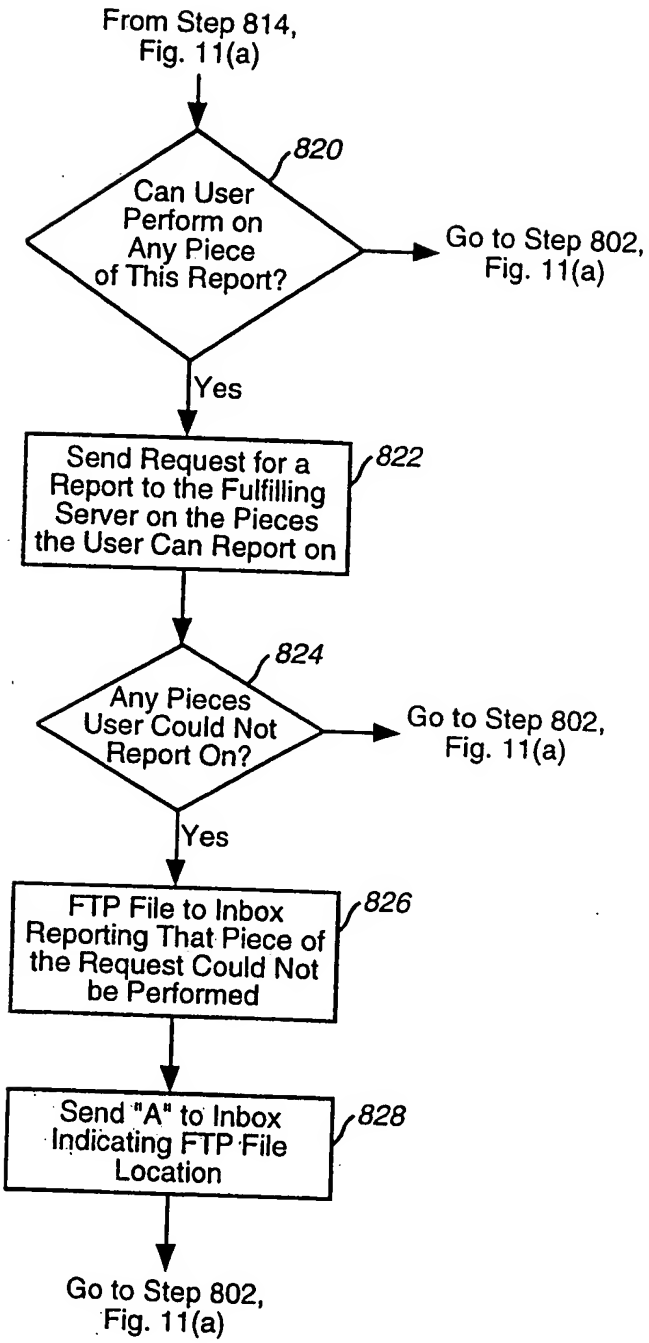
From Step 814, Fig. 11(a)
820
Can User Perform on Any Piece of This Report?
Go to Step 802, Fig. 11(a)
Yes
Send Request for a Report to the Fulfilling Server on the Pieces the User Can Report on
822
824
Any Pieces User Could Not Report On?
Go to Step 802, Fig. 11(a)
Yes
FTP File to Inbox Reporting That Piece of the Request Could Not be Performed
826
Send "A" to Inbox Indicating FTP File Location
828
Go to Step 802, Fig. 11(a)

FIG. 11(b)

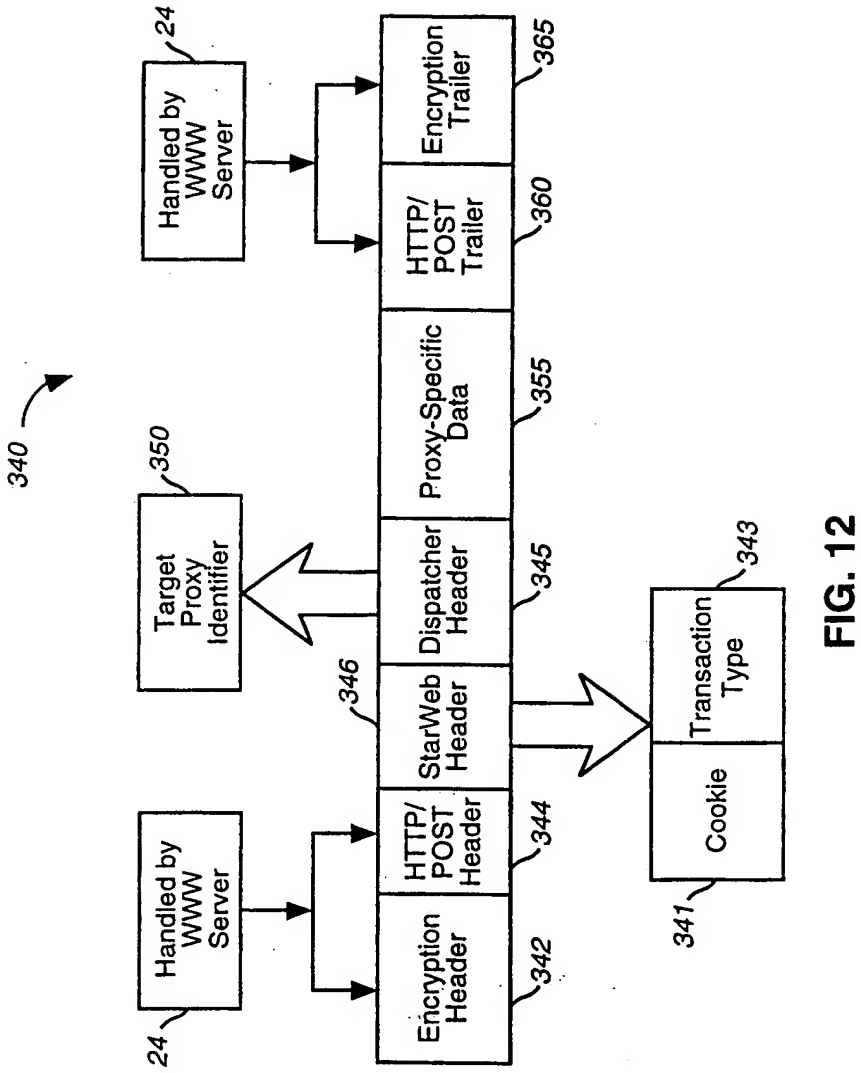
340
Handled by WWW Server
24
Encryption Trailer
365
HTTP/ POST Trailer
360
Proxy-Specific Data
355
Target Proxy Identifier
350
Dispatcher Header
345
StarWeb Header
346
HTTP/ POST Header
344
Encryption Header
342
Handled by WWW Server
24
Transaction Type
343
Cookie
341

FIG. 12

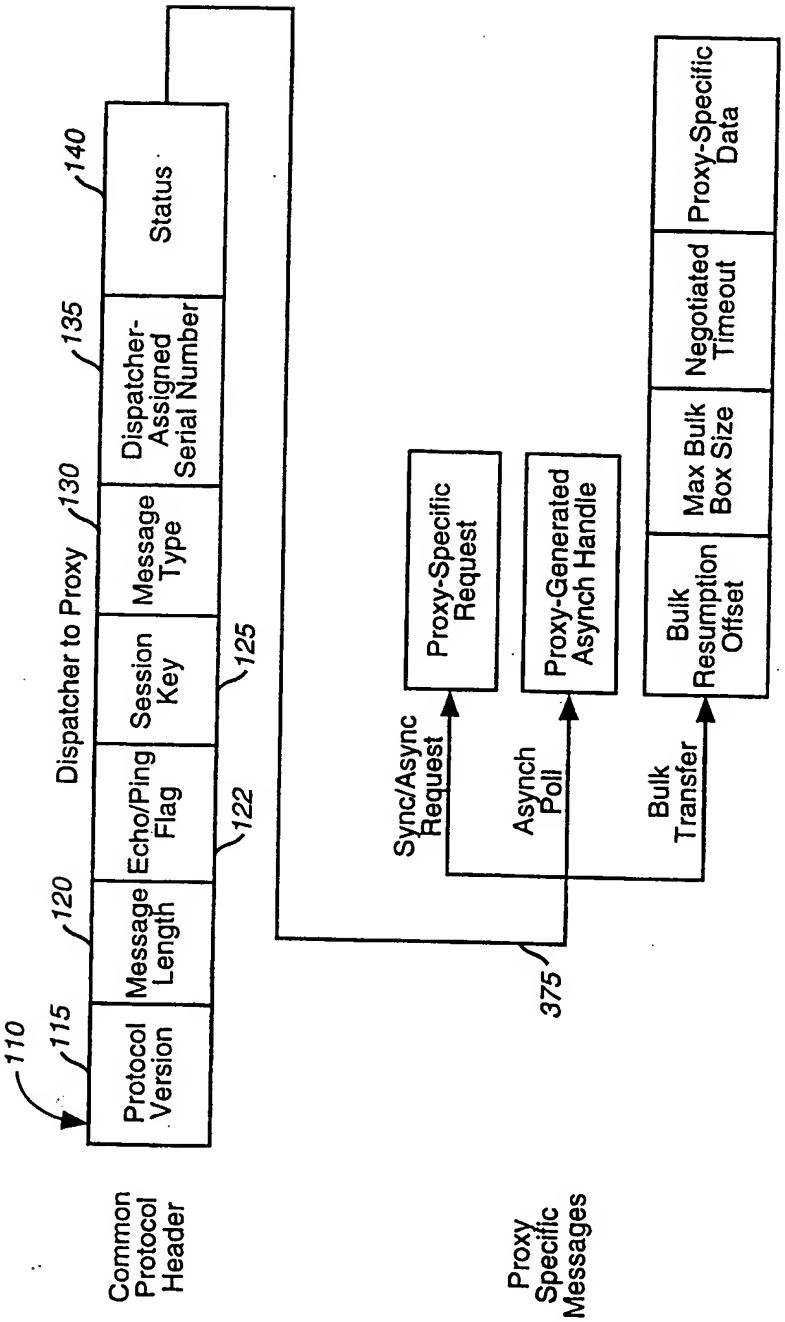
Common Protocol Header
Proxy Specific Messages
110
115
Protocol Version
120
Message Length
122
Echo/Ping Flag
125
Session Key
130
Message Type
135
Dispatcher-Assigned Serial Number
140
Status
Dispatcher to Proxy
375
Sync/Async Request
Asynch Poll
Bulk Transfer
Proxy-Specific Request
Proxy-Generated Asynch Handle
Bulk Resumption Offset
Max Bulk Box Size
Negotiated Timeout
Proxy-Specific Data

FIG. 13(a)

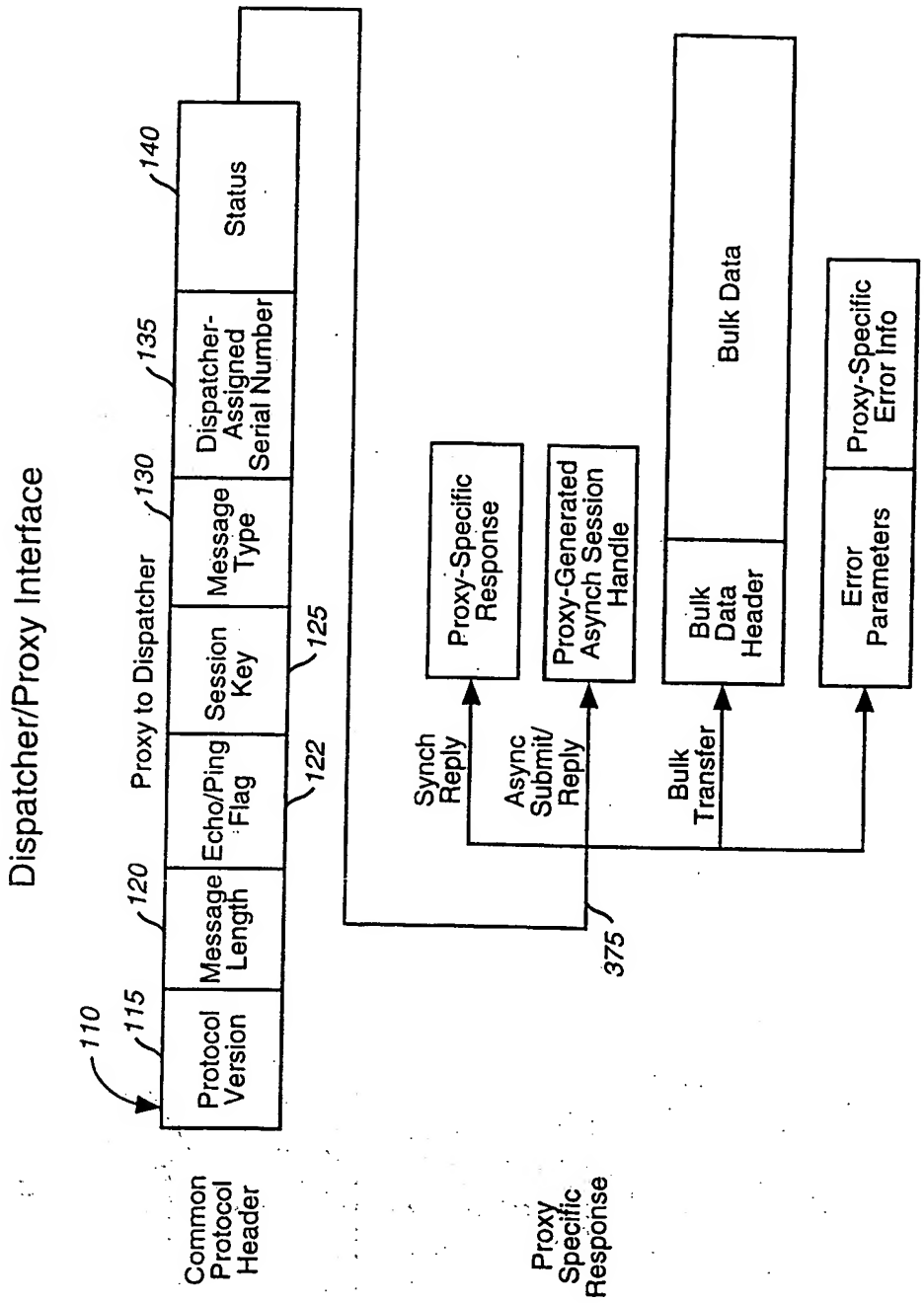
Dispatcher/Proxy Interface
Common Protocol Header
Proxy to Dispatcher
Protocol Version
Message Length
Echo/Ping Flag
Session Key
Message Type
Dispatcher-Assigned Serial Number
Status
110
115
120
122
125
130
135
140
Proxy Specific Response
Synch Reply
Async Submit/ Reply
Bulk Transfer
Proxy-Specific Response
Proxy-Generated Asynch Session Handle
Bulk Data Header
Bulk Data
Error Parameters
Proxy-Specific Error Info
375

FIG. 13(b)

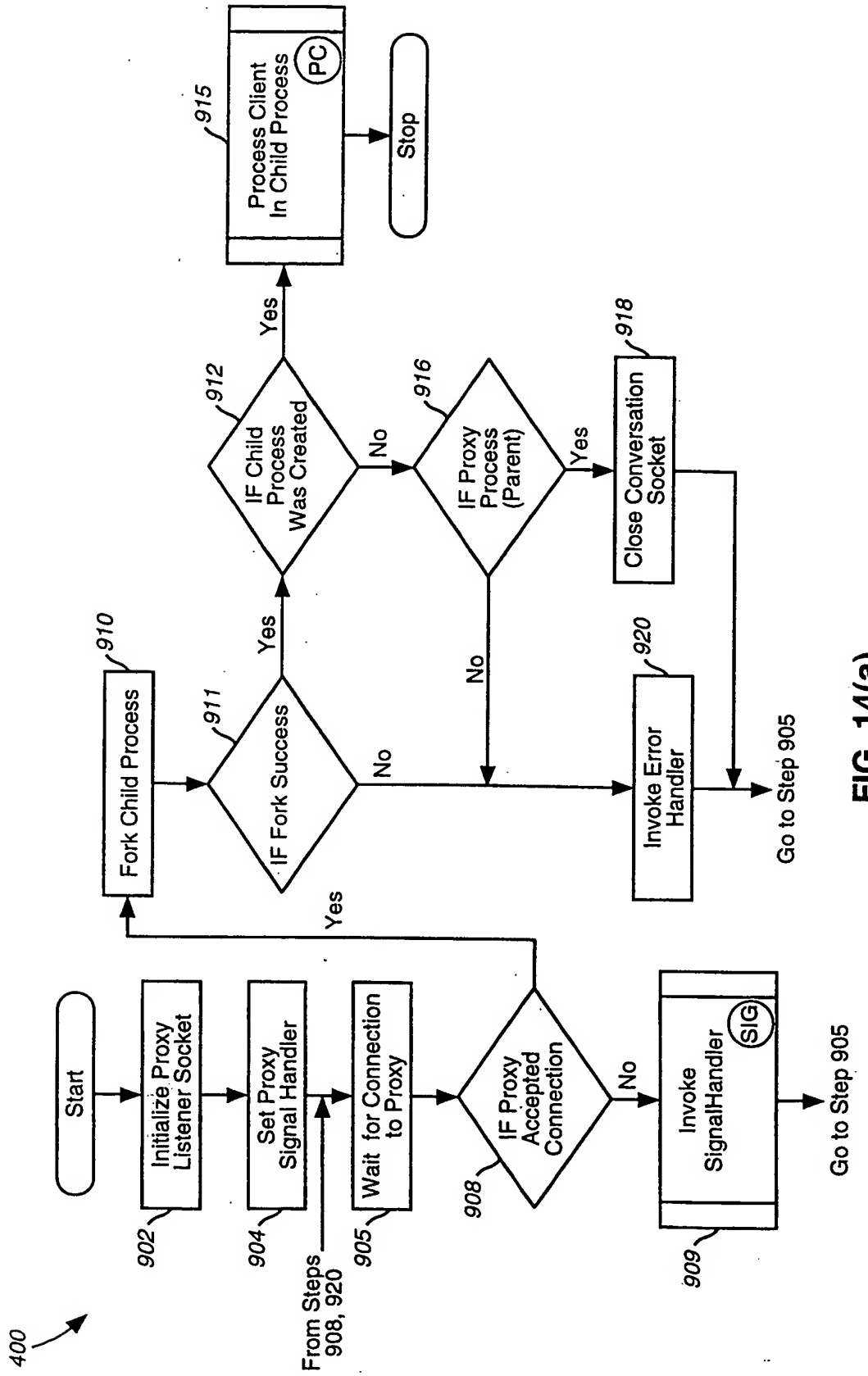
400
Start
Initialize Proxy Listener Socket
902
Set Proxy Signal Handler
904
From Steps 908, 920
Wait for Connection to Proxy
905
IF Proxy Accepted Connection
908
No
Invoke SignalHandler
SIG
909
Go to Step 905
Yes
Fork Child Process
910
IF Fork Success
911
Yes
No
IF Child Process Was Created
912
Yes
Process Client In Child Process
PC
915
Stop
No
IF Proxy Process (Parent)
916
Yes
Close Conversation Socket
918
No
Invoke Error Handler
920
Go to Step 905

FIG. 14(a)

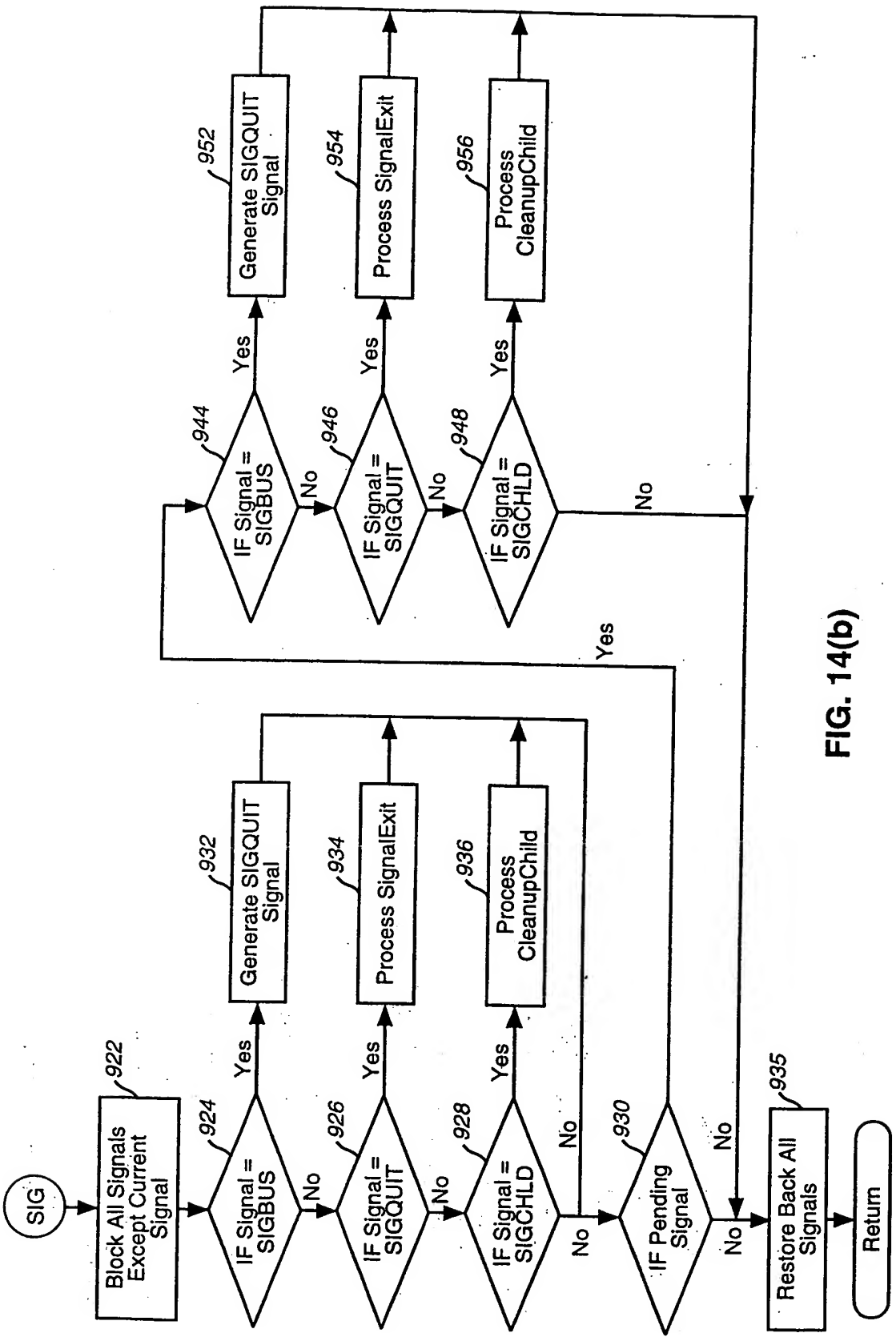
SIG
Block All Signals Except Current Signal
922
IF Signal = SIGBUS
924
Yes
No
Generate SIGQUIT Signal
932
IF Signal = SIGQUIT
926
Yes
No
Process SignalExit
934
IF Signal = SIGCHLD
928
Yes
No
Process CleanupChild
936
IF Pending Signal
930
Yes
No
Restore Back All Signals
935
Return
IF Signal = SIGBUS
944
Yes
No
Generate SIGQUIT Signal
952
IF Signal = SIGQUIT
946
Yes
No
Process SignalExit
954
IF Signal = SIGCHLD
948
Yes
No
Process CleanupChild
956

FIG. 14(b)

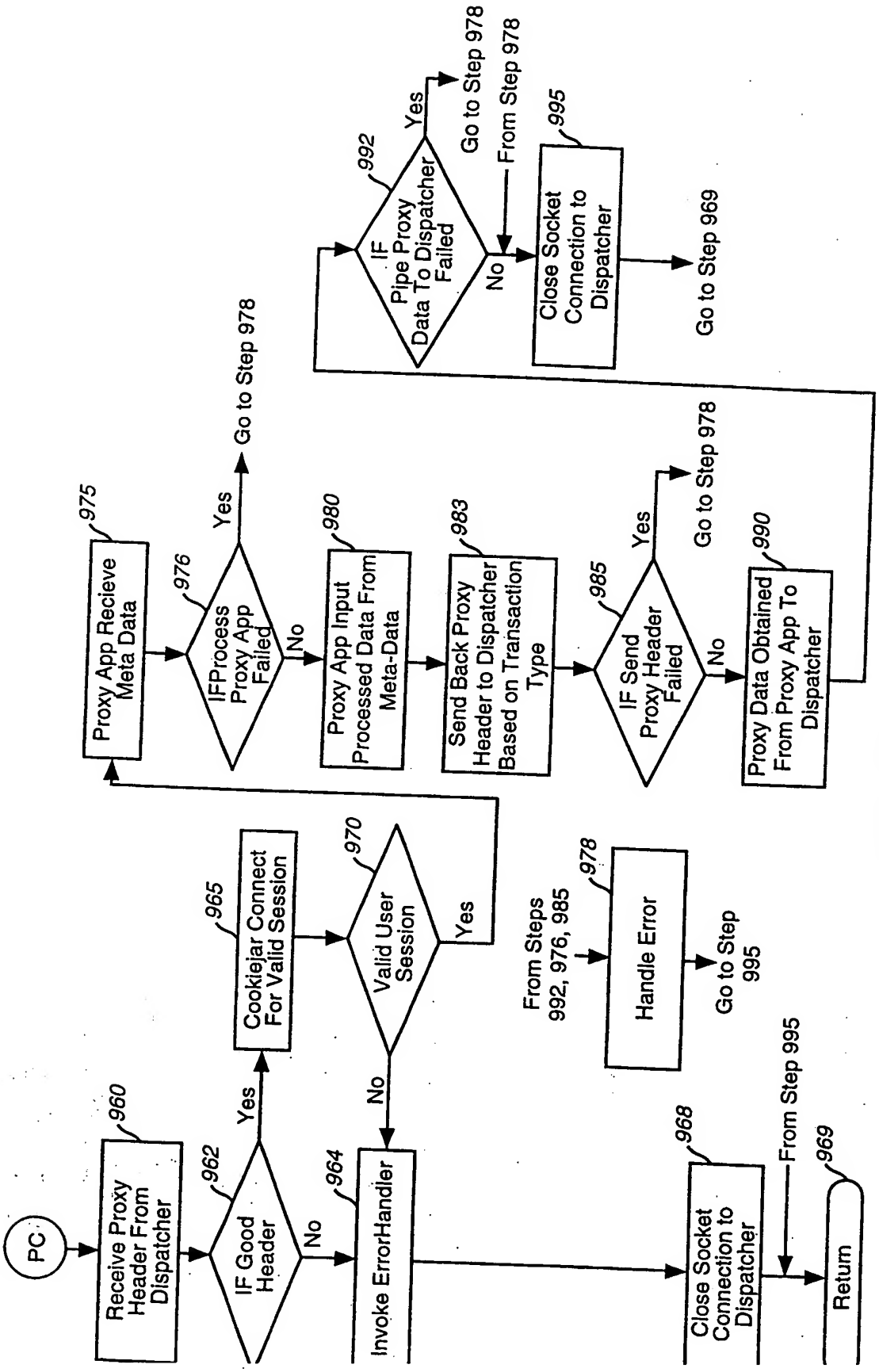
PC
Receive Proxy Header From Dispatcher
960
IF Good Header
962
Yes
No
Cookiejar Connect For Valid Session
965
Valid User Session
970
Yes
No
Invoke ErrorHandler
964
From Steps 992, 976, 985
Handle Error
978
Go to Step 995
Close Socket Connection to Dispatcher
968
From Step 995
Return
969
Proxy App Recieve Meta Data
975
IFProcess Proxy App Failed
976
Yes
Go to Step 978
No
Proxy App Input Processed Data From Meta-Data
980
Send Back Proxy Header to Dispatcher Based on Transaction Type
983
IF Send Proxy Header Failed
985
Yes
Go to Step 978
No
Proxy Data Obtained From Proxy App To Dispatcher
990
IF Pipe Proxy Data To Dispatcher Failed
992
Yes
Go to Step 978
From Step 978
No
Close Socket Connection to Dispatcher
995
Go to Step 969

FIG. 14(c)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/20144

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06F 13/00
US CL :395/200.33, 200.47, 200.49, 200.59; 379/112, 204
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 395/200.33, 200.47, 200.49, 200.59; 379/112, 204

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS
(user or customer or subscriber), (web or internet or intranet), report###, entitlement#

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,P	US 5,696,906 A (PETERS et al) 09 December 1997, col 1,lines 45-50, col 2, lines 12-15, lines 19-23, col 4, lines 15-67, col 6, lines 17-31, lines 45-67, col 8, lines 26-31, lines 45-50, col 13, lines 4-65, col 14, col 18, lines 42-67.	1-26

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 04 JANUARY 1999	Date of mailing of the international search report 03 FEB 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer MOUSTAFA M. MEKY Telephone No. (703) 305-9697

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